Studio Display (21" CRT, 19.8" viewable image size)

Basics

Studio Display (21" CRT, 19.8" viewable image size)

Overview

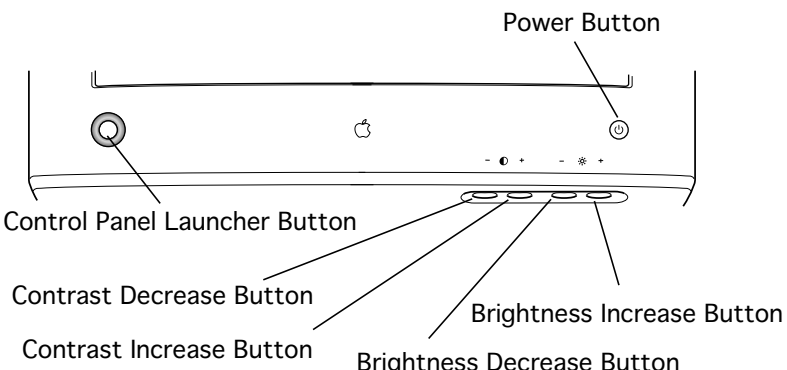
The Studio Display (21" CRT, 19.8" viewable image size) supports screen resolutions ranging from 640 x 480 at 60 Hz to 1600 x 1200 at 85 Hz.

The Studio Display (21" CRT) complies with TCO 99 as certified by the Swedish Confederation of Professional Employees to meet global safety tests and energy-saving features.

Features

Features of the Studio Display (21" CRT) include

- 21-inch (19.8-inch diagonal viewable image size) Sony Trinitron CRT
- 0.25/0.27 mm variable aperture grille pitch
- four USB ports for high-speed USB devices
- horizontal scan rate of 31.5–106 kHz
- multiple resolutions
- translucent plastic housing and tripod stand
- user controls for brightness, contrast, and the Monitors & Sound control panel
- compatibility with USB-based, 1999-model Power Macintosh G3 or Power Mac G4 computers (refer to “Extended Compatibility for Service” in this chapter for more details on compatibility)
- Energy Star compliance



The front panel of the display includes the following controls:

- power button
- brightness increase and decrease
- contrast increase and decrease
- control panel launcher button

The control panel launcher button opens the Monitors & Sound control panel window.

Repair Issues

Caution: Out of the box, the Studio Display (21" CRT) weighs 77 pounds (35 kg). Use caution when lifting or moving the display. To move it, lift it by the hand grips on the bottom of the display. It is recommended that two people lift the monitor together.

The new exterior design features of this display include a two-color translucent housing, a tripod monitor stand, and a VGA-style video cable with a VGA-to-Macintosh adapter.

Protecting the Translucent Housing

Important: Because the housing of this monitor is made of translucent plastic, surface scratches can be more visible than on a standard plastic housing. To avoid cosmetic damage and protect the housing during service procedures, please keep in mind the following precautions:

- Use a protective pad that is clean and free of debris whenever you service the display.
- Use caution working with metal tools to avoid scratching the housing.
- Before placing the display face down on a book or ream of paper, ensure the surface provides protection from scratches.

New Tripod Stand Safety Tips

Because this is a new design, keep in mind the following:

- **Caution:** Lift the display by the hand grips under the left and right sides of the display. Never lift the display by the tripod stand.
- **Caution:** Do not adjust the position of the monitor by pushing or pulling the stand legs. The tripod stand is subject to cracking or breakage if mishandled.
- ⚠**Warning:** When placing the monitor on a table surface, ensure that all three legs on the tripod stand contact the surface. If one of the legs is too close to the table edge, the weight of the monitor could cause the display to fall off the edge.

VGA-to-Macintosh Adapter

The connector on the display cable is a VGA video connector.

To ensure the proper connection to your computer or video card, click the icon Update.pdf for instructions on using the VGA-to-Macintosh adapter that comes with the Studio Display (21" CRT).

Update.pdf

Extended Compatibility for Service

This Studio Display (21" CRT) works with USB-based, 1999-model Power Macintosh G3 or Power Mac G4 computers. These configurations are still the only approved configurations for customers using this display. However, Apple-authorized service providers may service the display using the following PCI-based Power Macintosh computers, running Mac OS 8.5 or later, with a third-party Keyspan USB card installed in the PCI slot:

- Power Macintosh 4400
- Power Macintosh 6500
- Power Macintosh 7200
- Power Macintosh 7250
- Power Macintosh 7300
- Power Macintosh 7350
- Power Macintosh 8500
- Power Macintosh 8550

Find out about the Keyspan USB card at: http://www.keyspan.com

- Power Macintosh 8600
- Power Macintosh 9600
- Power Macintosh 9650

To properly set up the display to work with one of the listed Power Macintosh computers, follow these steps:

1 Confirm that the computer has at least 2 MB VRAM (required to enable all screen resolutions).

2 Install the Keyspan USB card in the PCI expansion slot.

3 Perform a clean install with Mac OS 8.5 or later.

4 **Important:** To avoid a system “freeze” with a blank screen, open the Energy Saver control panel and set the system sleep mode to Never.

5 Install USB driver 1.1 or later (called Mac Installer) from the disc that comes with the Keyspan USB card.

6 Install Apple Displays Software 1.7.1 or later.

7 Restart system and verify that USB ports are working.

USB Display Service Utility, version 2.1.2

In February 2000 version 2.1.2 of the USB Display Service Utility was introduced. The main difference between this version and earlier versions is the addition of PowerBook (FireWire) compatibility.

Important: Destroy previous versions of the USB Display Service Utility. To avoid loss of data, use only the latest version of the USB DSU. Refer to the Read Me file for more information. You can access the Read Me file and the latest version of the USB Display Service Utility from the Service Diagnostics page from Service Source Online.

⚠**Warning:** If you plan to use a PowerBook (FireWire) to download setup parameters, refer to “When the Second Display is a PowerBook (FireWire)” in the Adjustments chapter. You must follow that procedure to avoid loss of data or functionality.

Apple Displays Software, version 1.8

In August 1999 version 1.8 of the Apple Displays Software was released. One of the main differences from previous versions (1.7.1 and earlier) is the name of a control panel.

The Monitors & Sound control panel (in versions 1.7.1 and earlier), used for some screen adjustments, is now called the Monitors control panel in version 1.8 and later. The features of the Monitors control panel are the same as the old Monitors & Sound control panel, except audio controls now have their own separate Sound control panel.

References in this manual that previously specified the Monitors & Sound control panel, now specify the Monitors control panel.

New Housing Color

In August 1999, a new version of the Studio Display (21" CRT) was introduced. The display performance and internal circuitry remains the same as the original version. However, the new version offers a new housing color.

Unlike the original colors of translucent blue and white, the new version of the display is translucent graphite and white.

Important: The housing parts (rear housing, bottom housing with colored control panel buttons, intermediate bezel, front bezel, product ID label, and USB label) should be exchanged like for like.

The following table shows the Apple part numbers for the housing parts that differ

by color. Finished goods number M6204LL/A represents the original blue and white version; M6204LL/B represents the new graphite and white version.

Part Name	M6204LL/A	M6204LL/B
Rear housing	922-3681	922-3914
Bottom housing	922-3723	922-3917
Intermed. bezel	922-3726	922-3916
Front bezel	922-3725	922-3913
Product ID label	922-3756	922-3918
USB label	922-3757	922-4055

In addition, a button panel kit (076-0805) contains one of each color of the button control panel (brightness and contrast buttons).

New Version of CRT/Video Board

In November 1999, a new version of the CRT/video board was released. The new version was necessary to handle a discontinuation of a board component. Adding a different manufacturer's component required a somewhat different board layout.

Important: Version 2 (Apple part number 661-2231) is not backward compatible with Version 1 (Apple part number 661-2116). Before replacing a CRT/video board, you must verify its version and exchange boards like for like.

For details on identifying the two boards, refer to the section "Two Versions of the CRT/Video Board" in the Troubleshooting chapter.

U.S. Repair Strategy

The Studio Display (21" CRT) can be serviced by Apple-Authorized Service Providers (AASPs). For those repairs that cannot be performed by the AASP (such as CRT repair/replacement), the service facilitation process is in place.

Parts

To order replacement parts, use the AppleOrder system and refer to Studio Display (21" CRT) in the “Service Price Pages.” Large businesses, universities, and K-12 accounts must provide a purchase order on all transactions, including orders placed through the AppleOrder system.

Service providers not enrolled in AppleOrder may fax their orders to Service Provider Support (512-908-8125) or mail them to the following address:

Apple Computer, Inc.
Service Provider Support
Mail Stop 212-SPS
2323 Ridgepoint Drive
Austin, TX 78754

Ordering

Apple Service Providers planning to support the Studio Display (21" CRT) may facilitate service by calling 800-919-2775.

For more details on this facilitation process, please refer to the Facilitation Process in the archived service notices section of the Service Source CD. (Open the Notices Archive folder at the top level of the Main CD. The complete path is Notices Archive: Service Notices Archive: Service Source Startup: Service Information: Notices: Service Notices: Archived List: Facilitation Process.)

If you have further questions, please call Service Provider Support at 800-919-2775 and select option 1.

Warranty and AppleCare Protection Plan

The Studio Display (21" CRT) is covered under the Apple One-Year Limited Warranty. The AppleCare Protection Plan is also available for this product. Service Providers are reimbursed for warranty and AppleCare Protection Plan repairs facilitated for this display. For pricing information, refer to “Service Price Pages.”

Canada Repair Strategy

The service strategy for the Studio Display (21" CRT) is module replacement. However, sometimes replacing modules may not resolve the issue. For those issues, whole-unit replacements are available. To limit “no fault found” returns on the unit, please use the following procedure when you require a whole-unit replacement:

1 Troubleshoot the unit to ensure the problem is not with the software or with the computer.

2 After confirming the issue is with the display, refer to Service Source Online or the Service Price Pages to order the modules necessary to repair the display.

3 If the module necessary is not available, or you require a whole-unit replacement, call Technical Service Provider Support (TSPS) at 1-800-217-9517. Have

your 10-digit service account number (beginning with 61) ready. Be prepared to explain the issue, your troubleshooting steps, and the display's serial number to the TSPS phone agent.

4 After verifying the troubleshooting you've performed, the TSPS phone agent will authorize the repair by giving you the whole-unit service replacement part number, and a Vantive case number.

5 Use AppleOrder to place the order for the whole-unit service replacement by manually populating the Part Number field with the part number given to you by the TSPS. Then mark the order for review, and put the Vantive case number in the Comments field. Failure to do so will result in your order being declined.

6 When you receive the whole-unit service replacement, return the old display as you would any service module.

Specifications

Studio Display (21" CRT, 19.8" viewable image size)

Introduction

Specifications information for the Studio Display (21" CRT) can be found in the Spec Database, which you can access in one of three ways:

- Launch it directly by double-clicking the Apple Spec Database runtime alias at the top level of the Main Service Source CD.
- Select “Apple Spec Database” from the Service Source drop-down main menu.
- Click the Acrobat toolbar icon for the database, which is near the right end of the toolbar with the letters “SP.”

Apple Studio Display with ColorSync Technology

Features

Exceptional display quality

- 21-inch (19.8-inch viewable image size) Sony Trinitron CRT
- Aperture grille technology for vivid colors and sharp text
- Vertically flat screen for reduced glare

Stunning design

- Elegant translucent case that matches Apple's latest Power Macintosh G3 computers
- Storage space under the display for your keyboard
- Four-port USB hub for connecting peripherals

Built-in color calibration

- Uses industry-standard ColorSync color management technology
- Ensures consistent, accurate color over the lifetime of the monitor
- Saves production time by creating accurate output with fewer trials

Easy access to powerful software controls

- Single-button access to the familiar Macintosh Monitors & Sound control panel
- Intuitive control over all screen adjustments

Color is indispensable to today's computer applications, whether you're producing magazines, creating business presentations, or designing multimedia materials.

The Apple Studio Display with ColorSync technology is an uncompromising monitor that provides accurate color for every situation. It combines lifetime color calibration with outstanding visual performance and a stunning appearance—all for little more than competitive monitors without those features.

The first thing you'll notice about this Apple Studio Display is its striking appearance. Its elegant translucent enclosure and sleek design complements Apple's newest Power Macintosh G3 systems and is also highly functional. It includes a four-port Universal Serial Bus (USB) hub, and its unique stand has room underneath to store your keyboard.

The Apple Studio Display with ColorSync technology uses a 21-inch (19.8-inch viewable image size) Trinitron CRT to deliver vivid colors and sharp text. The cylindrical design of this CRT creates a vertically flat screen that minimizes glare. The end result is a monitor that's a pleasure to view and to work with.

But the most important feature of the Apple Studio Display with ColorSync technology is its superior color accuracy—and its ability to maintain that accuracy over its lifetime. Using a patented internal measurement system, the monitor adjusts its electron beam as time passes to maintain the precise calibrations made at the factory. It can also compensate for changes in the ambient light. And because it stores its own ColorSync profiles, it can exchange accurate color information with the other devices in your production process, creating color consistency that directly translates into fewer trial-and-error stages when you output color documents.

The Apple Studio Display makes it easy to meet your specific needs and to compensate for changes in environmental conditions. A button on the display brings up the familiar Macintosh Monitors & Sound control panel on your computer, giving you powerful yet intuitive software control over all screen adjustments.

With its large screen, crisp Trinitron performance, ready-to-use USB ports, built-in color calibration, and elegant design, the Apple Studio Display with ColorSync technology is the complete monitor for demanding applications.

Technical Specifications

Picture tube
- 21-inch (diagonal) Trinitron CRT
- 19.8-inch (diagonal) viewable image size
- Variable, superfine 0.25- to 0.27-mm aperture grille pitch

Resolutions and refresh rates*
- 640 by 480 pixels at up to 85 Hz
- 800 by 600 pixels at up to 85 Hz
- 832 by 624 pixels at up to 75 Hz
- 1,024 by 768 pixels at up to 85 Hz
- 1,152 by 870 pixels at up to 75 Hz
- 1,280 by 1,024 pixels at up to 85 Hz
- 1,600 by 1,200 pixels at up to 85 Hz

Scanning rates
- 31 to 107 kHz (horizontal)
- 48 to 120 Hz (vertical)

User controls (hardware and software)
- Power on/off
- Brightness
- Contrast
- Horizontal size and centering
- Vertical size and centering
- Convergence
- Rotation
- Pincushion
- Keystone
- Parallelogram
- Bow
- Geometry corner correction
- Separate four-corner beam landing correction
- Overscan
- Degauss

Color controls
- Internal calibration system
- Gamma curve adjustment
- Completely variable white-point selection (4,100K to 9,300K)
- Designed for optimal reproduction of PANTONE colors

Screen treatment
- High-contrast, antireflective, antistatic coating

Connectors and cables
- 15-pin mini D-Sub VGA connector
- VGA-to-Macintosh adapter
- Four-port USB hub

Electrical requirements
- Line voltage: 90V to 264V AC
- Frequency: 47 to 63 Hz, single phase
- Power: 180W (maximum) when operating; less than 30W in standby mode; less than 5W when computer is in energy-saver mode

Agency approvals
- MPR II
- CE Mark
- EPA ENERGY STAR compliant
- IEC 950
- UL1950
- CSA 950
- EN60950
- NUTEK
- TCO 99
- FCC Part 15 Class B; DOC Class B

Environmental requirements
- Operating temperature: 50° to 104° F (10° to 40° C)
- Storage temperature: 32° to 140° F (0° to 60° C)
- Operating humidity: 20% to 95% noncondensing
- Storage humidity: 5% to 95% noncondensing
- Operating altitude: 0 to 10,000 feet (0 to 3,048 m)

Size and weight
- Height: 22.3 inches (56.6 cm)
- Width: 20.1 inches (51.1 cm)
- Depth: 21.7 inches (55.0 cm)
- Weight: 77 pounds (35 kg)

System requirements
- The new Power Macintosh G3 computer with built-in USB
- Mac OS 8.0 or later

*Not all computer models and configurations are capable of driving the monitor to the highest display format it supports.

Nothing works and looks better with a new Power Macintosh G3 computer than an Apple Studio Display with ColorSync technology (sold separately).

Ordering Information

Apple Studio Display with ColorSync technology
Order No. M6204LL/A

- Apple Displays software
- VGA-to-Macintosh adapter
- Power cord
- Ambient light tool
- User's setup guide
- Limited warranty

For More Information

For more information about this product, or to find out where to buy Apple products, visit www.apple.com on the World Wide Web or call 1-800-538-9696. To purchase this product from the Apple Store, go to www.apple.com/store.

Apple stands behind its products with world-class service and support. Offering quality parts, extended hardware service options, phone support, and support via the Internet, we provide you with support choices that meet your needs. For more information, visit www.apple.com/support.

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January 1999 L03536B

Apple Studio Display with ColorSync Technology

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- Storage space under the display for your keyboard
- Four-port USB hub for connecting peripherals

Built-in color calibration
- Uses industry-standard ColorSync color management technology
- Ensures consistent, accurate color over the lifetime of the monitor
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Ordering Information

Apple Studio Display with ColorSync technology
Order No. M6204LL/B

- Apple Displays software
- Power cord
- Ambient light tool
- User's setup guide

For More Information

For more information about this product, or to find out where to buy Apple products, visit www.apple.com/products on the World Wide Web or call 800-538-9696. To purchase this product from the Apple Store, go to www.apple.com/store.

Apple stands behind its products with world-class service and support. Offering quality parts, extended hardware service options, phone support, and support via the Internet, we provide you with support choices that meet your needs. For more information, visit www.apple.com/support.

Technical Specifications

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- Power on/off
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- Parallelogram
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- Geometry corner correction
- Separate four-corner beam landing correction
- Overscan
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- Internal calibration system
- Gamma curve adjustment
- Completely variable white-point selection (4,100K to 9,300K)
- Designed for optimal reproduction of PANTONE colors

Screen treatment
- High-contrast, antireflective, antistatic coating

Connectors and cables
- 15-pin mini D-Sub VGA connector
- Four-port USB hub

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- Line voltage: 90V to 264V AC
- Frequency: 47 to 63 Hz, single phase
- Power: 180W (maximum) when operating; less than 30W in standby mode; less than 5W when computer is in energy-saver mode

Agency approvals
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- CE Mark
- EPA ENERGY STAR compliant
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Environmental requirements
- Operating temperature: 50° to 104° F (10° to 40° C)
- Storage temperature: 32° to 140° F (0° to 60° C)
- Operating humidity: 20% to 95% noncondensing
- Storage humidity: 5% to 95% noncondensing
- Operating altitude: 0 to 10,000 feet (0 to 3,048 m)

Size and weight
- Height: 22.4 inches (56.9 cm)
- Width: 22.6 inches (57.4 cm)
- Depth: 21.7 inches (55.0 cm)
- Weight: 77 pounds (35 kg)

System requirements
- A 1999-model Power Macintosh G3 computer or a Power Mac G4 computer with built-in USB
- Mac OS 8.5 or later

Nothing works and looks better with a new Power Mac G4 computer than an Apple Studio Display with ColorSync technology (sold separately).

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August 1999 L04180A

Troubleshooting

Studio Display (21" CRT, 19.8" viewable image size)

General

The “Symptom Charts” section included in this chapter will help you diagnose specific symptoms related to your product. Because cures are listed on the charts in the order of most likely solution, try the first cure first. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next cure. **Note:** If you have replaced a module, reinstall the original module before you proceed to the next cure.

If you are not sure what the problem is, or if the symptom charts do not resolve the problem, contact Apple Technical Support.

First Checklist

Important: To prevent needless module replacement and unnecessary time delays, read this checklist before you return a module.

The display is not compatible with all computers.

This Studio Display (21" CRT) works with USB-based, 1999-model Power Macintosh G3 or Power Mac G4 computers. Refer to “Extended Service Compatibility” in the Basics chapter for more details on compatibility.

For best display performance, operate the display in one of the factory-preset screen resolutions.

The CRT raster will not always resemble a perfect rectangle.

CRT tolerances allow for some distortion. Additional distortion can be caused by magnetized metal objects (desks, file cabinets). Rotate the monitor or move it to a different location if you notice raster bowing or bent raster edges. You can also use the Monitors control panel or the USB Display Service Utility to make geometry adjustments to optimize the screen display.

Jitter, faint lines, or screen movement can be caused by the computer or external interference such as electronic devices and fluorescent lights.

Fluorescent lights, computers, other monitors, or electronic appliances such as coffee makers and copy machines can cause raster distortion. Move the unit to another room or building to determine if external interference is the source of the problem.

Note: If the raster has shifted up/down or right/left only, adjust it using the geometry controls in the Monitors control panel (Apple Displays Software). Keep in mind that if you then move the monitor to another location you may need to readjust the controls. If the display changes (for better or worse) when you move it to another location, the environment is the source of the problem. Move the monitor or the distortion-causing object.

☑ Variances in screen color and brightness are usually caused by the setup controls or the environment.

Screen color purity over the entire screen may not always be perfect. CRT tolerances allow for some distortion.

Try adjusting the beam landing, rotation, brightness, or contrast to reduce or eliminate the symptom.

Color imperfections can be caused by magnetized metal objects (desks, file cabinets). Move the unit to a different location if you notice color blotches or a change in brightness on an area of the screen. If the display changes (for better or worse) when you move it to another location, the environment is the source of the problem. Relocate the monitor or move the distortion-causing object.

☑ A misadjusted screen can mimic the symptoms of main deflection board or CRT failures.

By performing the adjustment procedures, you might determine if one or more of the adjustments is the cause of the problem.

Symptom Charts

Note: Check this section periodically for updates and new symptoms and cures.

Important: For procedures that require the monitor to be turned on, allow the monitor to warm up for approximately 30 minutes, unless instructed otherwise.

No Video

No video (screen is black); power indicator light off	1 Shut down computer and monitor. Inspect power cord for damage; use ohmmeter to check for continuity. 2 Verify that monitor power cord is connected to power socket on back of computer, that computer is connected to live power source, that monitor power button is on, and that computer connected to display is on. 3 Check for blown fuse (located at FP1) on power board. If blown, replace it with 4 A, 250 V fuse (Apple part number 922-0502). Turn on power. If fuse blows again, replace power board. If fuse blows again, it is likely that an electrical short on the main deflection board is causing the blown fuse. In this case, reinstall original power board (with a new fuse), and replace main deflection board. Then follow the steps in “Adjusting the Display after Replacing the Main Deflection Board” in the Adjustments chapter. 4 Check for loose connections at user controls (control panel) board. Reseat board and connectors. 5 Replace user controls (control panel) board.
No video (screen is black); amber power indicator light on	1 Check cable connections. **Important:** Check for bent pins on the video connector. Be sure the USB and video cables from the monitor are connected to the ports on the computer. 2 Verify computer video signal by connecting known-good monitor. 3 Check internal cable connections to CRT/video board. 4 Replace main deflection board, and follow the steps in “Adjusting the Display after Replacing the Main Deflection Board” in the Adjustments chapter. 5 Replace power board. 6 Replace video cable. 7 If the symptom remains, follow the steps in “Connecting a Second Monitor for Downloading Setup Parameters” in the Adjustments chapter. Then follow the steps in “Downloading Setup Parameters and Replacing the CRT/Video Board” and

“Adjusting the Display after Replacing the CRT/Video Board” in the Adjustments chapter.

No video (screen is black); green power indicator light on	1 Check that front panel Brightness and Contrast controls are not set to their minimum settings. 2 Check that video/USB cable connections are secure between monitor, adapter, and computer. 3 Check that single-pin connector B104 on CRT/video board is completely seated. 4 Check that both pins at connector BL1 (red and black wires from CRT yoke to main deflection board) are seated properly. 5 Follow the steps in “Checking High Voltage” in this chapter. If the high voltage is 0 V DC, replace main deflection board, and follow the steps in “Adjusting the Display after Replacing the Main Deflection Board” in the Adjustments chapter. 6 If the symptom remains after replacing the main deflection board, follow the steps in “Connecting a Second Monitor for Downloading Setup Parameters” in the Adjustments chapter. Then follow the steps in “Downloading Setup Parameters and Replacing the CRT/Video Board” and “Adjusting the Display after Replacing the CRT/Video Board” in the Adjustments chapter.

Geometry

Shape of raster is distorted	1 Read “First Checklist” at the beginning of this chapter. 2 Degauss the display by shutting down the computer and monitor, and then waiting 20 minutes before turning on computer and monitor. (The screen will degauss at power-on using the display’s internal degaussing circuitry.) 3 Rotate monitor at least 90 degrees or move it to another location. If symptom changes, there is an environmental problem caused by stray magnetic fields, and the monitor is operating normally. 4 From the Monitors control panel, click Geometry icon and then click Factory Settings button. 5 If necessary, adjust geometry controls to optimize front-of-screen performance. 6 Replace main deflection board, and follow the steps in “Adjusting the Display after Replacing the Main Deflection Board” in the Adjustments chapter.

Screen Color

Screen is one predominant color

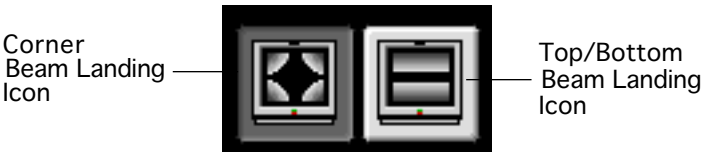
1 Remove video cable and adapter at computer and check connectors for damaged or missing pins. Verify that video cable is securely connected to computer.
2 Check for bent pins on internal connections.
3 Open Monitors control panel, and click Color icon. Verify that a standard white point has been selected (D50, 6500, or 9300). Then click Recalibrate button (recalibration can take 20 seconds to 2-1/2 minutes).
4 Check that CRT socket connection is tight and there are no bent pins on the CRT neck.
5 Refer to the Adjustments chapter. Follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board." Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."

Screen shows blotches of color

1 Degauss the display using an external degaussing coil, if available. (You can purchase a degaussing coil for about $25 at most larger electronic parts stores.)
2 From the Monitors control panel, click Geometry icon and then click Beam Landing button.

Caution: Changes made from the Beam Landing screen are automatically saved when you click OK. Therefore, only click OK when you are sure the adjustments you have made are optimal. If you click Reset before clicking OK, the screen will reset to the previously saved screen configuration (the state of the screen when OK was clicked last).

3 Adjust the display as follows to minimize color blotches:



- If color blotches appear in the corners of the screen only (not along the top or bottom of the screen), then click the Corner Beam Landing icon and use the -/+ slider control to individually adjust the color purity for the affected corner(s). Click OK when done.
- If color blotches appear along the top or bottom of the screen, click the Top/Bottom Beam Landing icon and use the -/+ slider control to adjust the color purity for the top and bottom of the screen. Click OK when done.
  - **Important:** Do not use the Top/Bottom Beam Landing control to adjust color in the corners of the screen. The

Top/Bottom Beam Landing control affects the entire horizontal span of the top and bottom of the display screen.

- Any time you adjust the Top/Bottom Beam Landing, check the screen rotation. Because the position of the raster can be affected by the top/bottom beam landing adjustment, go back to the Geometry screen and click Rotate to correct the screen's rotation.
- Recheck the screen for color blotches. If color blotches appear in the corner(s), then make the Corner Beam Landing adjustment.

4 Shut down computer and monitor, and move them to an area where there are no external speakers or large metal objects such as benches or cabinets that could cause a stray magnetic field. (Refer to "First Checklist" at the beginning of this chapter.)

5 If you don't see improvement, degauss the display again. If you don't have a hand-held degaussing coil, wait 20 minutes before turning on computer and monitor. (The screen will degauss at power-on using the display's internal degaussing circuitry.)

6 If the beam landing adjustment had no affect, verify that beam landing coils are connected.

7 Call Apple Technical Support (in the US, call 800-919-2775, option 3).

Screen Brightness

Screen is very bright (monitor might shut down)

1 Adjust front panel Brightness and Contrast controls.

2 Check high voltage as described in "Checking High Voltage" in this chapter.

3 Refer to the Adjustments chapter. Follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board." Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."

USB

Device connected to USB port does not work

1 Verify USB cable plugged into a working Power Macintosh G3 (Blue and White).

2 Try USB device in all four USB ports on the display. If device is still not working, check that it functions by plugging it directly into the Power Macintosh G3 (Blue and White).

3 Use the Apple System Profiler software found under the Apple menu to see whether the Studio Display (21" CRT) is recognized as a USB device. Check that the attached USB

devices are listed in the Devices and Volumes tab. All of the connected USB devices should be listed.
If the display and any devices plugged into the display are not listed, verify that all of the internal USB cable connectors are seated correctly. Reseat the cables to be sure of a tight fit.

4 Verify that cable connectors at USB assembly are seated correctly. Reseat connectors. Check cable connections to power board.

5 Replace USB assembly.

Miscellaneous

Screen jitter at 1600 x 1200 resolution

A slight jitter may be visible when connected to the ATI Rage 128 video card in the Power Macintosh G3 (Blue and White). If so, refer to the Power Macintosh G3 (Blue and White) service manual. (The customer might need to replace the video card.)
Important: The display is not at fault and should not be replaced.

Limited Geometry and Color controls when display connected to Apple video card

Due to signal dependencies not present on the VGA-style connector of most third-party cards, you must use the VGA-to-Macintosh adapter (Apple part number 922-3769) to connect the display to the DB-15 video connector, if the card has one. The VGA-to-Macintosh adapter is included with the Studio Display (21" CRT).

By using the VGA-to-Macintosh adapter and connecting to the DB-15 port on the card, the additional video controls become available for use. Be sure to connect the adapter to the card first, then connect the display cable.

Popping sound that may or may not be followed by blank screen

Note: This problem most likely can occur within the first few hours or days after installation. However, it is possible to hear the popping sound or see the screen go blank for a moment anytime during the life of the product. CRT arcing is normal and expected on a certain percentage of CRT-type displays from all manufacturers. An arc happens when residual particles inside the CRT are dislodged. This usually occurs when the display has experienced physical vibration like transportation. The arc time is short and there is no safety hazard because the arc is contained inside the sealed glass of the CRT. This arcing will not cause permanent damage to the display.

Note: Operating the display at higher altitudes can increase the probability of the popping sound.

1 Turn off monitor power button. Wait a few seconds, and turn on monitor power button.

2 Shut down computer and monitor. Unplug power cord and

video/USB cables. Count to ten. Then plug in power cord and video/USB cables. This action should remove all symptoms.

Faint shadows or “ghosting” on text of desktop icons

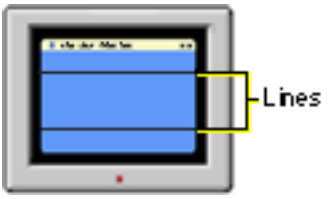
1 Verify that video cable and adapter are securely connected to computer. Check for bent pins on both external and internal connections.
2 If using a third-party cable extender or video switch box, remove it.
3 If wiggling video cable connectors improves the symptom, replace video cable.

Apple Displays Software working incorrectly (adjusting screen parameters has no effect; display is not listed on the Monitors control panel)

1 Reinstall Apple Displays Software and reboot computer.
2 Verify USB connection by using the control strip to change resolutions.

Thin horizontal lines on screen

Displays larger than 15 inches with tron-style CRTs typically have two wires, each about one-quarter to one-third of the way from the top and bottom of the display image. These supporting wires, which are thinner than a human hair, stabilize the aperture grill against shocks. The lines are common to all tron-style displays and are not screen defects. They cannot be adjusted out or eliminated by repairing or replacing display modules.



Display does not work with USB card in Power Macintosh computer

Important: For customers, the Studio Display (21" CRT) is approved only for use with USB-based, 1999-model Power Macintosh G3 or Power Mac G4 computers. However, you can service this display using one of the following PCI-based Power Macintosh computers, running Mac OS 8.5 or later, with a third-party Keyspan USB card installed in the PCI expansion slot:

- Power Macintosh 4400
- Power Macintosh 6500
- Power Macintosh 7200
- Power Macintosh 7250
- Power Macintosh 7300

- Power Macintosh 7350
- Power Macintosh 8500
- Power Macintosh 8550
- Power Macintosh 8600
- Power Macintosh 9600
- Power Macintosh 9650

Note: Other third-party USB cards have not been tested with this display.

To properly set up the display to work with one of the listed Power Macintosh computers, follow these steps:

1 Confirm that the computer has at least 2 MB VRAM (required to enable all screen resolutions).
2 Install the Keyspan USB card in the PCI expansion slot.
3 Perform a clean install with Mac OS 8.5 or later.
4 **Important:** To avoid a system "freeze" with a blank screen, open the Energy Saver control panel and set the system sleep mode to Never.
5 Install USB driver 1.1 or later (called Mac Installer) from the disc that comes with the Keyspan USB card.
6 Install Apple Displays Software 1.7.1 or later.
7 Restart system and verify that USB ports are working.

Displays message: "There is not sufficient power for USB device"

This message can occur when the display is used with a third-party Keyspan USB card in a PCI-based Power Macintosh running Mac OS 8.6. Keyspan is working with Apple to resolve this. A software update is expected soon. For the latest information, check this Keyspan support page: http://www.keyspan.com/products/USB/card/docs/swp/aaFAQS.htm#MacOS86

In the meantime, try this:

1 Disconnect and reconnect the USB devices. They should work correctly after doing this.
2 Install an earlier version of Mac OS (such as 8.5).

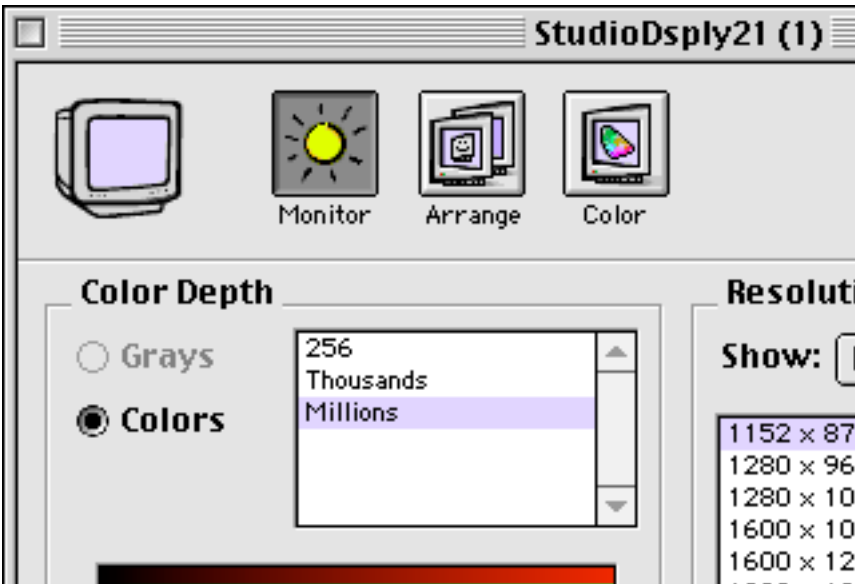
Display does not wake from sleep when using Keyspan USB card

This happens when the display is used with a third-party Keyspan USB card using USB driver 1.1. Apple is working on a solution. As soon as the solution is ready, Keyspan will post an update to the driver on their Web site. For the latest information, refer to this Keyspan support page: <http://www.keyspan.com/products/USB/card/docs/swp/aaFAQS.htm#MacOS86>

In the meantime, set the computer sleep mode to Never.

Geometry button missing from Monitors control panel; USB card not recognized

This symptom could occur if the display was set up incorrectly with a third-party Keyspan USB card in a PCI-based Power Macintosh computer. The Monitors control panel appears as follows with a truncated title bar (StudioDsply21) and a missing geometry button:



1. To properly set up the configuration, go to the symptom " Display does not work with USB card in Power Macintosh computer" in this chapter. Follow the steps in sequence. Ensure the USB software is installed before the Apple Displays Software.
2. If the symptom remains, refer to the Adjustments chapter. Follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board." Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."

Display is on, but control panel launcher button does not work

1. Check for loose connection at USB port and verify compatibility of computer system (refer to "Extended Compatibility for Service" in Basics chapter).
2. Check for loose connections at user controls (control panel) board. Reseat board and connectors.
3. Check for loose connections at cables on bottom housing behind CRT. Reseat connectors.
4. Replace user controls (control panel) board.
5. Replace front bezel.
6. Refer to the Adjustments chapter. Follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board." Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."

AppleVision error message occurs

The steps you take to correct this problem depend on the conditions under which this error message occurs. There are three possible cases:

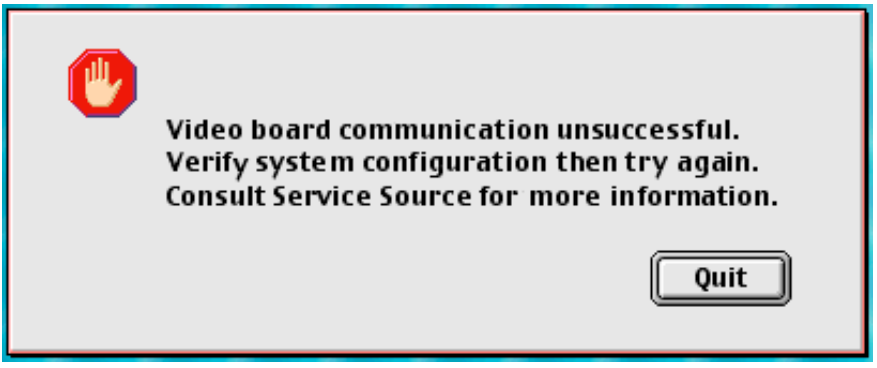
- **Case 1**—Error message appears when you have downloaded setup parameters, removed the old CRT/video board, installed a new CRT/video board, and restarted the system.
  1. Ensure you are using the latest version of the USB Display Service Utility.
  2. Refer to the Adjustments chapter to upload the setup parameters as described in "Upload Parameter Settings." Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."
- **Case 2**—Error message appears when you have erroneously installed a new CRT/video board without downloading setup parameters.
  1. Reinstall the original CRT/video board.
  2. Refer to the Adjustments chapter, and follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board." Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."
- **Case 3**—Error message appears when you first turn on the display and you have not yet performed any service repairs.
  1. Ensure you are using the latest version of the USB Display Service Utility. This version of the USB DSU can correct this problem automatically if you download and upload the setup parameters without replacing the CRT/video board (as described in the next step).
  2. **Important: Without replacing the CRT/video board,** perform the steps in "Download Setup Parameters" and "Upload Setup Parameters" in the Adjustments chapter. Then adjust the display as described in "Adjusting the Display after Replacing the CRT/Video Board."

An AppleVision error occurred.
This monitor was not configured properly at the factory. Please contact Apple Customer Service for assistance.
OK

Communication error message occurs when opening the USB Display Service Utility

If the following error message occurs,

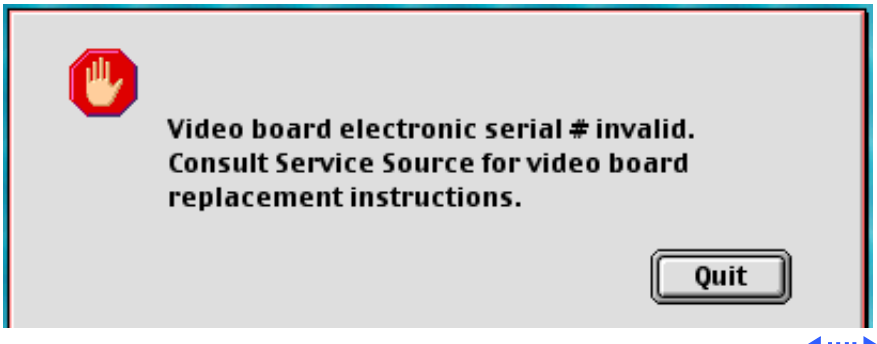
1 Confirm that computer you have connected to the Studio Display (21" CRT) is compatible. Refer to “Extended Compatibility for Service” in Basics chapter.
2 If using a third-party video card, check that it supports DDC (Data Display Channel).
3 Check external cable connections.
Important: Check for bent pins on the video connector. Be sure the USB and video cables from the monitor are connected to the ports on the computer.
4 If using a third-party cable extender or video switch box, remove it.
5 Check internal cable connections to CRT/video board.
6 Refer to the Adjustments chapter. Follow the steps in ”Downloading Setup Parameters and Replacing the CRT/Video Board.’ Then follow the steps in ”Adjusting the Display after Replacing the CRT/Video Board.”


Video board communication unsuccessful.
Verify system configuration then try again.
Consult Service Source for more information.
Quit

“Serial # invalid” error message occurs after replacing the original CRT/video board with a new board and trying to open the USB Display Service Utility

If the following error message occurs,

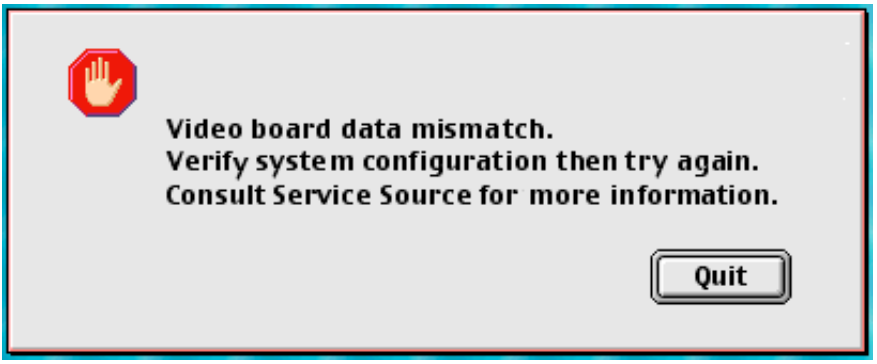
1 The replacement CRT/video board was not configured correctly at the factory; remove the board and replace with a new board.
2 Refer to the Adjustments chapter. Follow the steps in “Downloading Setup Parameters and Replacing the CRT/Video Board” to upload the parameter settings to the new board. Then follow the steps in ”Adjusting the Display after Replacing the CRT/Video Board.”



Error message occurs when using the USB Display Service Utility and the Write File procedure finishes

If the following error message occurs,

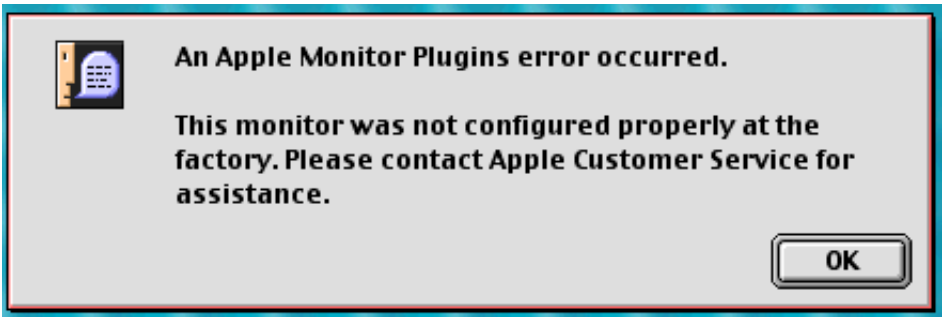
1 Check external cable connections.
Important: Check for bent pins on the video connector. Be sure the USB and video cables from the monitor are connected to the ports on the computer.
2 If using a third-party cable extender or video switch box, remove it.
3 Check internal cable connections to CRT/video board.
4 Repeat the Write File process up to three times.
5 Order a new CRT/video board. When it arrives, refer to the Adjustments chapter and follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board.' Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."


Video board data mismatch.
Verify system configuration then try again.
Consult Service Source for more information.
Quit

After system startup, Apple Monitor Plugins error message occurs

If the following error message occurs,

1 Click OK.
2 Reinstall the original CRT/video board.
3 Return the defective CRT/video board (the service part).
4 Order a new CRT/video board. When it arrives, refer to the Adjustments chapter and follow the steps in "Downloading Setup Parameters and Replacing the CRT/Video Board.' Then follow the steps in "Adjusting the Display after Replacing the CRT/Video Board."


An Apple Monitor Plugins error occurred.
This monitor was not configured properly at the factory. Please contact Apple Customer Service for assistance.
OK

Error message occurs after a new CRT/video board was installed and the Write File button was clicked

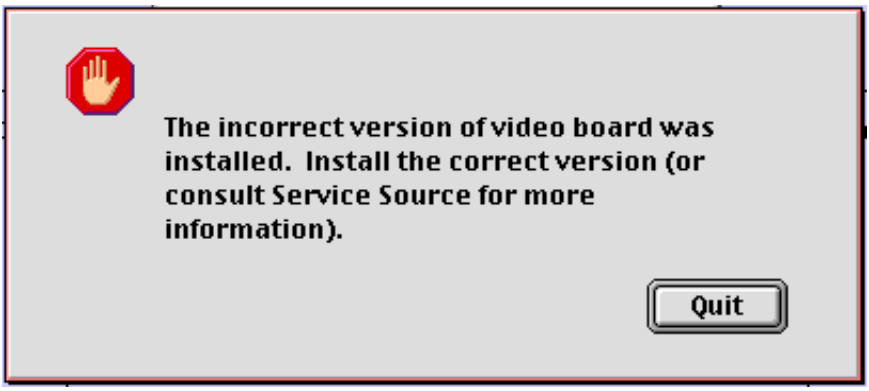
If the following error message occurs,

1 Click Quit.

2 Check that the version of the CRT/video board matches the original CRT/video board. See the section “Two Versions of the CRT/Video Board” in this chapter.

3 Install the same version of the CRT/video board, and continue the Upload Parameter Settings procedure as described in the Adjustments chapter.

Note: If you don’t have a matching version in stock, order a new CRT/video board and, while you wait for it to arrive, reinstall the original board. This way you ensure the CRT/video board parameter settings can still be downloaded when the new board arrives.


The incorrect version of video board was installed. Install the correct version (or consult Service Source for more information).
Quit

Checking High Voltage

This high-voltage check is a required procedure for some of the symptoms in this chapter. After checking high voltage, return to the symptom chart, if necessary.

Warning: Read all of the warnings, notes, and steps of this procedure before beginning.

Warning: Do not perform this procedure without someone else nearby. If there is an accident, someone nearby could save your life. Apple recommends that your staff be trained in cardiopulmonary resuscitation (CPR).

Warning: Voltage at the anode, with the power on, can cause serious injury. Double-check all multimeter connections before taking the reading.

Caution: Do not attempt this procedure without the Apple high-voltage probe (Apple part number 076-0392). Use only the Apple high-voltage probe; other high-voltage probes will not give accurate readings for this procedure.

Warning: Probe the anode carefully. Serious damage and injury may occur if the anode is knocked off while the CRT is charged.

1. Turn off the monitor and computer. Disconnect the power cords and video/USB cables. Wait at least two minutes for the CRT to discharge.
2. Refer to the Take Apart chapter to remove the following:
   - USB cover
   - rear housing
   - anode cap cover (but not the anode cap)
3. Attach the Apple high-voltage probe to a multimeter and attach the ground wire to the chassis.
   Warning: Verify that the ground wire connection to the chassis is secure.
4. With the power switches off, connect the power cords and video/USB cables.
5. From the rear of the CRT—away from the CRT frame—carefully insert the probe under the anode cap.
6. Turn on the computer and monitor.
7. Note the reading on the meter. The reading should be 27 V DC (± 0.5 V DC). The high-voltage probe reduces the anode voltage by a factor of 1,000 to a level that can be safely measured on a multimeter. A reading of 27 V DC is equivalent to 27 kV DC at the anode.

⚠**Warning:** Do not remove the probe from under the anode cap until power is turned off. Injury or damage to equipment may occur.

8 If reading is 0 V DC, ensure the multimeter connections are in place and the multimeter is operating. If reading is still 0 V DC, replace the main deflection board.

9 If the reading is out of range, use the USB Display Service Utility, a multimeter, and the high-voltage probe. Use the high-voltage slider control on the USB DSU to make final adjustments until the high voltage reaches 27 V DC (± 0.5 V DC).

10 Turn off the monitor.

11 Unplug the monitor.

12 Remove the probe from under the anode cap.

13 Go back to the symptom chart for the next cure, if necessary.

Two Versions of the CRT/Video Board

Important: In November 1999, a second version of the CRT/video board was introduced. The second version is not backward compatible with the previous version (the original board). You must verify the version and replace boards like for like.

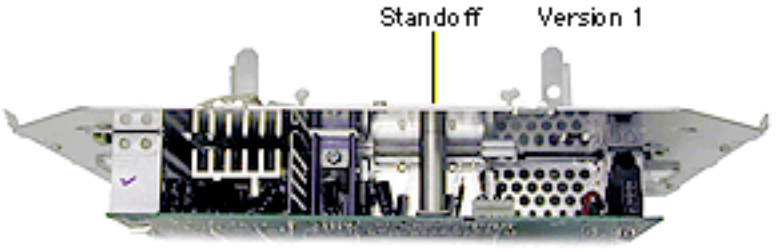
Check the serial number on the back of the display (rear housing). A serial number of WR9451T8HOE or later means the unit uses a version 2 board. To interpret the number, check the date code embedded in the number.

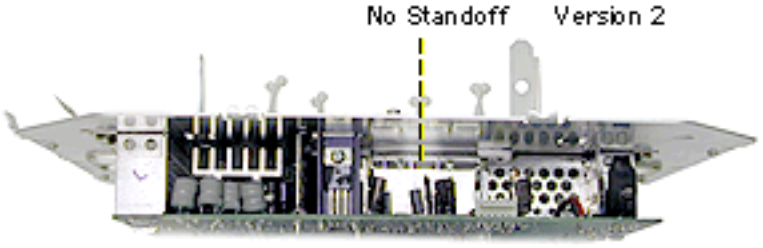
WR945xxxxxx can be interpreted as aaywwxxxxxx, where

- y = last digit of year (1999)
- ww = week of year (45th week)

So any units produced after the 45th week of 1999 use the version 2 board (661-2231). And units produced before that week have a version 1 board (661-2116) installed.

To visually identify the version of the board itself, check for a cylindrical standoff at the top of the board, as shown. Version 1 has a standoff; version 2 does not.





Note: An alternate way of identifying the board version is to check the 7-digit number (followed by a letter) on the solder side of the board:

- 820-0997-A, B, C, or D = Version 1
- 820-1082-A, B, C, or D = Version 2

Take Apart

Studio Display (21" CRT, 19.8" viewable image size)

Safety Guidelines

⚠**Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

⚠**Warning:** Never use a grounding wriststrap until after discharging the CRT and setting up an ongoing ground connection.

⚠**Warning:** When the rear housing is removed, avoid the sharp sheet-metal edges of the EMI shield, board chassis, and other metal areas of the display assembly.

New Tripod Stand Safety Tips

Important: Because this is a new design, keep in mind the following:

- Lift the display by the hand grips under the left and right sides of the display. Never lift the display by the tripod stand.
- Likewise, do not adjust the position of the monitor by pulling the stand legs. The tripod stand is subject to cracking or breakage if mishandled.
- When placing the monitor on a table surface, ensure that all three legs on the tripod stand contact the surface. If one of the legs is too close to the table edge, the weight of the monitor could cause the display to fall off the edge.

Protecting the Translucent Housing

Important: Because the housing of this monitor is made of translucent plastic, surface scratches can be more visible than on standard plastic housing. To avoid cosmetic damage and protect the housing during service procedures, please keep in mind the following precautions:

- Use a protective pad that is clean and free of debris whenever you service the display.
- Use caution working with metal tools to avoid scratching the housing.
- Before placing the display face on a book or ream of paper, ensure the surface provides protection from scratches.

Cable Reference

Important: Refer to the Exploded View chapter for two illustrations that show the detachable cables between the boards.

You might find it helpful to print the cable illustrations and refer to them when reassembling the display.

Service Tools

Required Tools

The following tools are required to service the Studio Display (21" CRT):

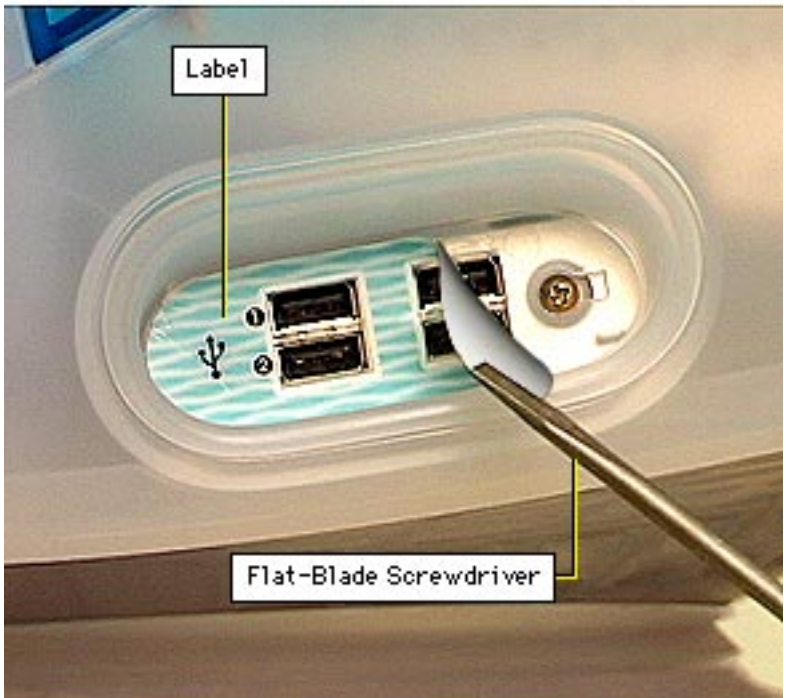
- Protective pad and a thick book or ream of paper on which to place the display face down
- Magnetic Phillips screwdriver
- Magnetic, long T-15 torx driver
- Flat-blade screwdriver
- CRT discharge tool (Apple part number 076-0381)
- Thin metal flat-blade nail file (such as from a pocket knife) or tweezers with a thin rounded end
- Popsicle sticks or orange stick (for wedging in-between intermediate bezel and rear housing)
- Set of jeweler's screwdrivers

Suggested Tools

- Turntable (for easily repositioning the monitor)
- Needlenose pliers

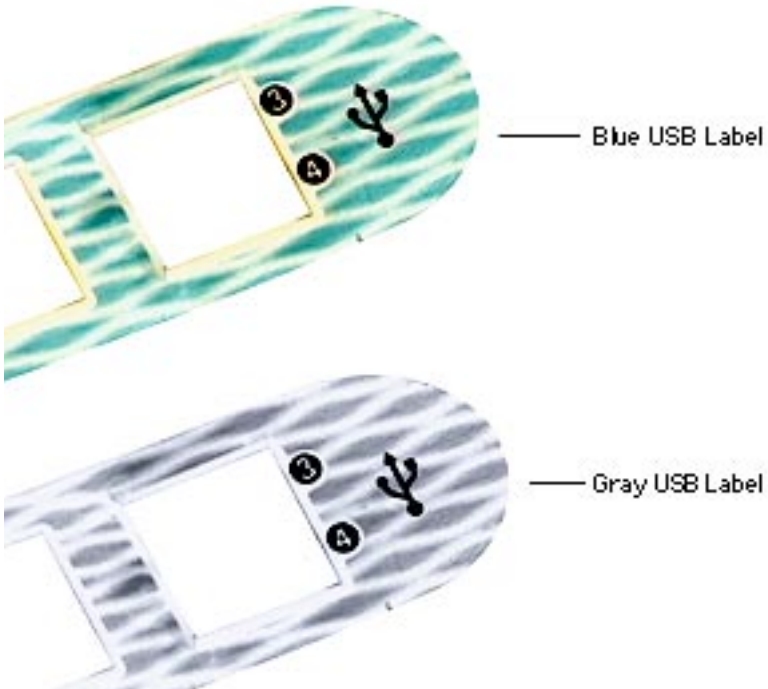
USB Cover

No preliminary steps are required before you begin this procedure.

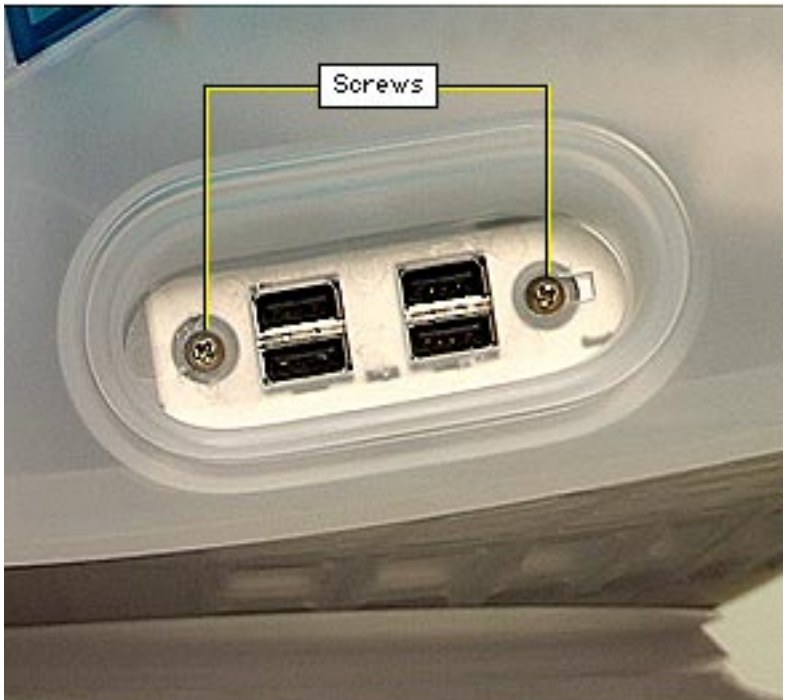


1 With the monitor upright, use a flat-blade screwdriver or needlenose pliers to peel off the USB label.

Replacement Note: The USB label should not be re-used because the adhesive may not hold the label properly. Therefore, replace the USB label as described in the next note.



Replacement Note: In August 1999 a new color version of the display was introduced. The USB label you use to replace the old label must match the housing color. Replace the USB label like for like (Apple part number 922-3757 for blue; Apple part number 922-4055 for gray).



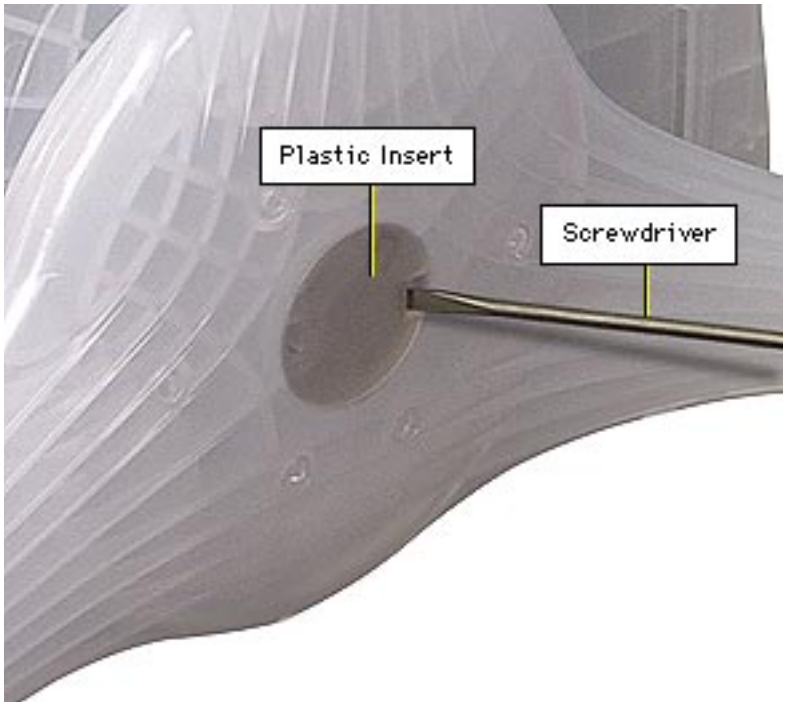
2 Use a Phillips screwdriver to remove the two screws.

3 Lift away the plastic USB cover from the housing.

Tripod Stand

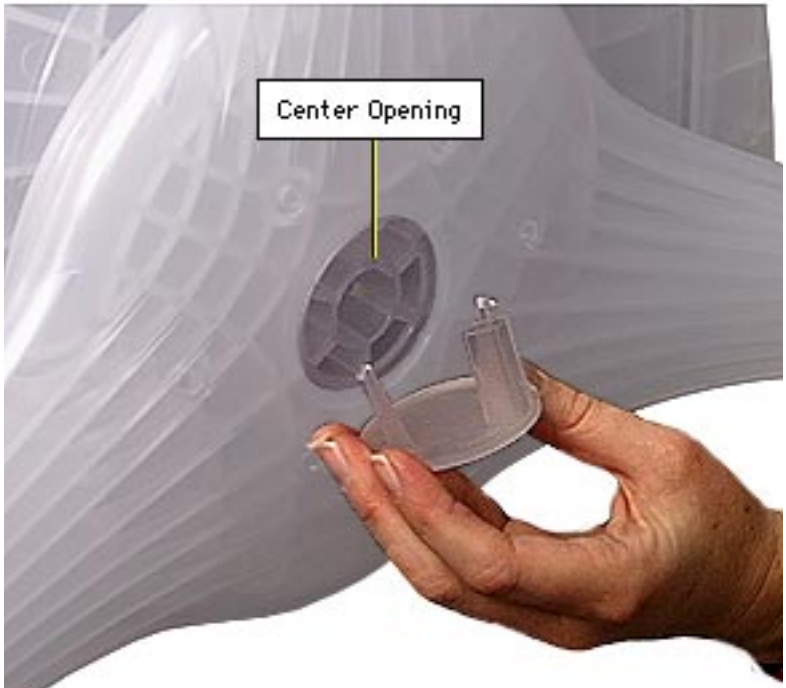
No preliminary steps are required before you begin this procedure.

Important: The tripod stand should remain attached for most of the Take Apart procedures. The tripod stand helps support the weight of the display, and it enables you to reposition the display as needed during the procedures.



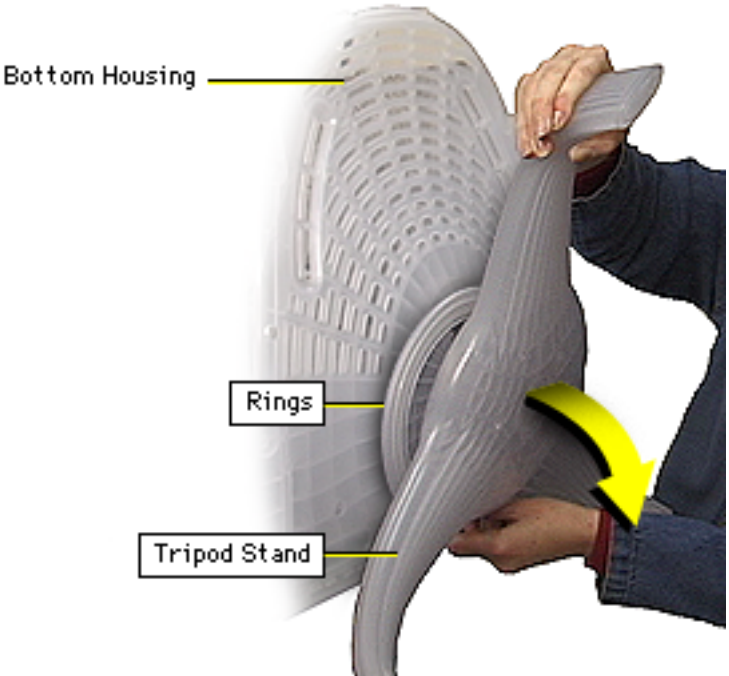
1 Place the display face down on a raised padded surface such as a thick book or ream of paper.

2 Use a flat-blade screwdriver to remove the plastic insert on the bottom of the tripod stand.



3 Looking through the center opening, slide up the tripod stand and rotate the stand until the inner tabs line up with the slots in the bottom housing.

4 When the inner tabs are aligned, firmly grasp the tripod stand and slide it up as far as it will go.



5 Pull the tripod stand toward you to remove it from the bottom housing. (The two plastic rings will drop as the tripod stand is removed.)

Replacement Note: The tripod stand (Apple part number 922-3682) includes the stand, the two rings, and the plastic insert.

Rear Housing

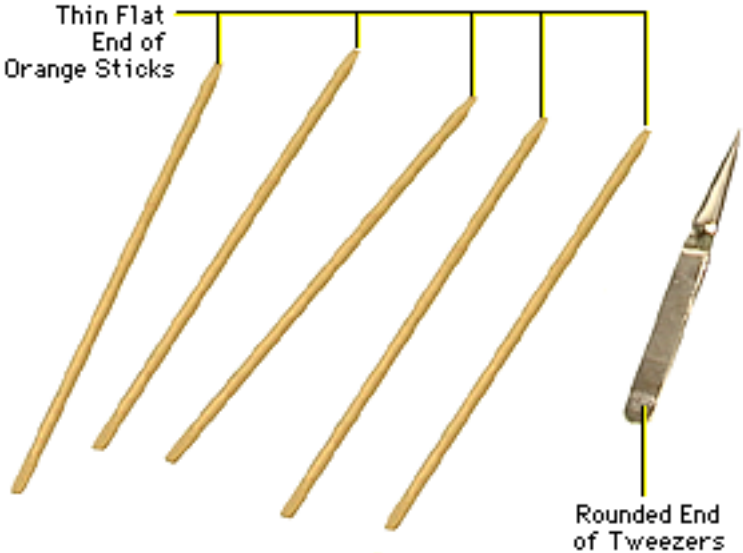
Before you begin, remove the USB cover.

Caution: To avoid scratching the rear housing, read all of the steps in this procedure before removing the rear housing.

1 **Caution:** Position the display near a table corner so you can rotate the monitor and reach all six rear housing screws from below. Ensure all three feet of the tripod stand maintain contact with the table.

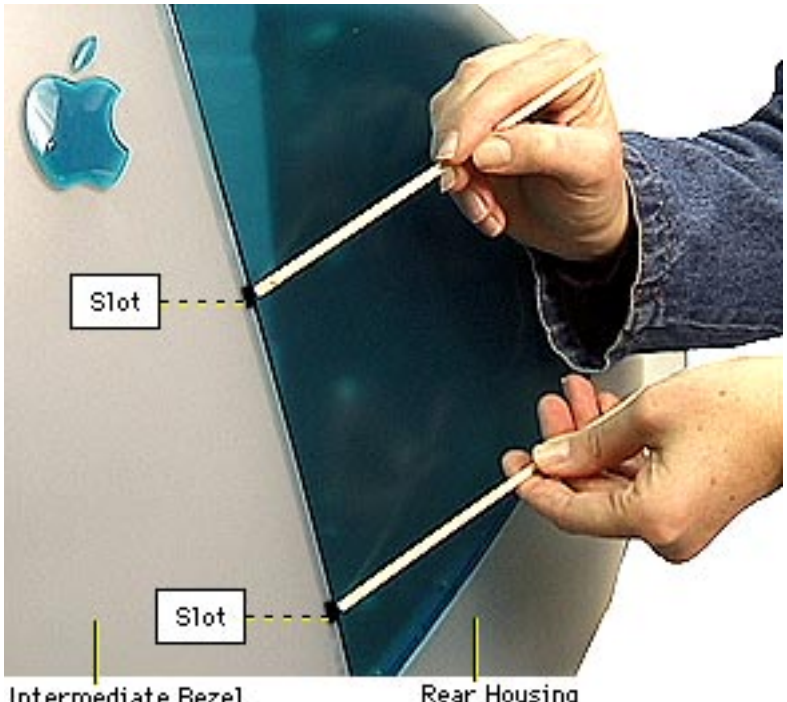
With the screen facing you, remove the two T-15 torx screws at the front underside of the rear housing.

2 Rotate the display to remove the remaining four T-15 torx screws that line the outer edge at the underside of the rear housing.

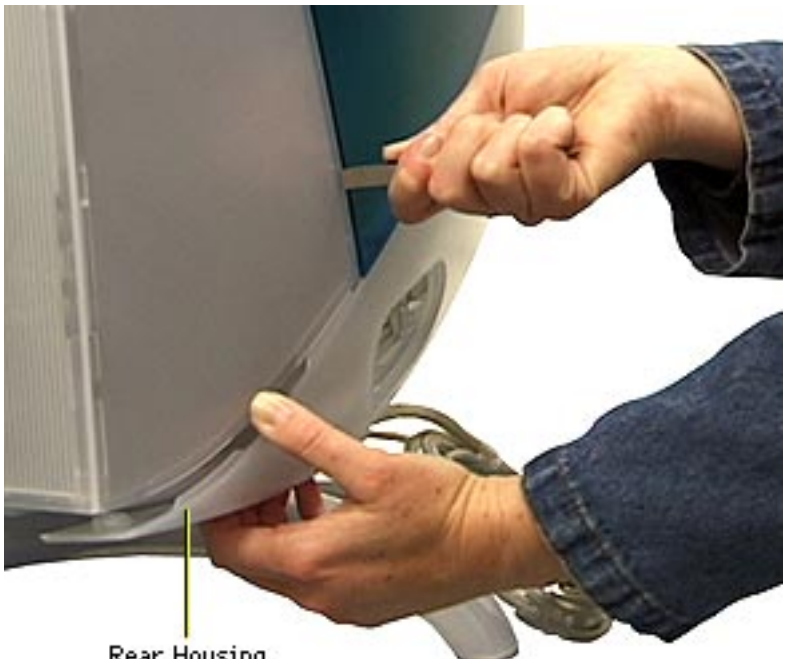


Important: You need the following non-marring rounded tools to disengage the rear housing tabs:

- Orange sticks and/or popsicle sticks (up to six)
- Ether a blunt nail file from a pocket knife or tweezers with a thin rounded end

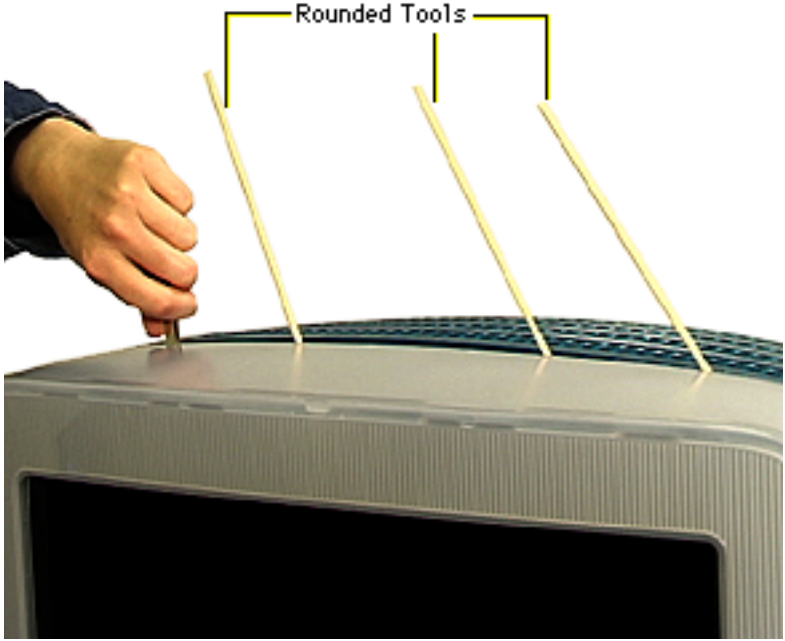


3 Check the seam where the rear housing meets the bezel. Notice the six slots (two on top, two on each side.

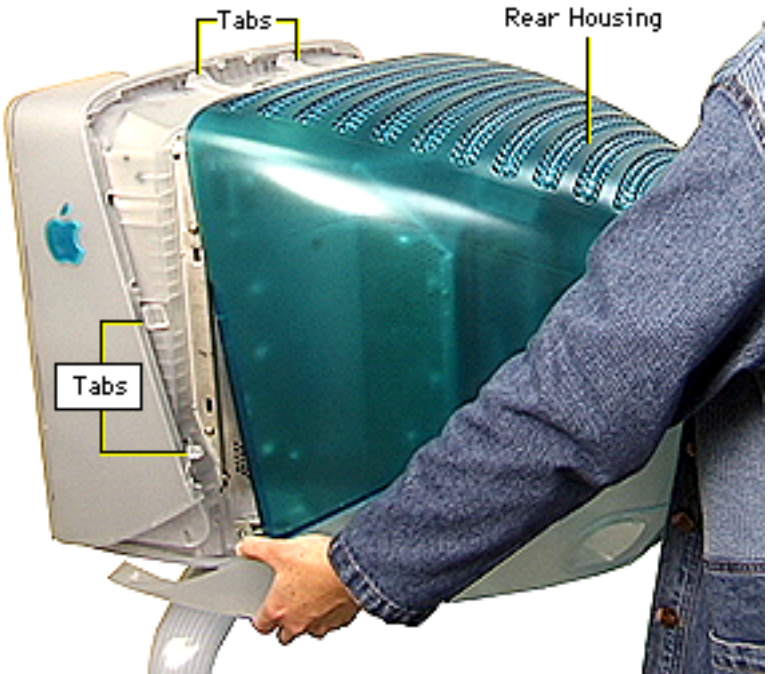


4 Starting at one side of the rear housing, wedge a rounded tool, such as the nail file from a pocket knife, into the lower slot to disengage the tab.

5 Flex the side of the rear housing as you disengage the first tab.

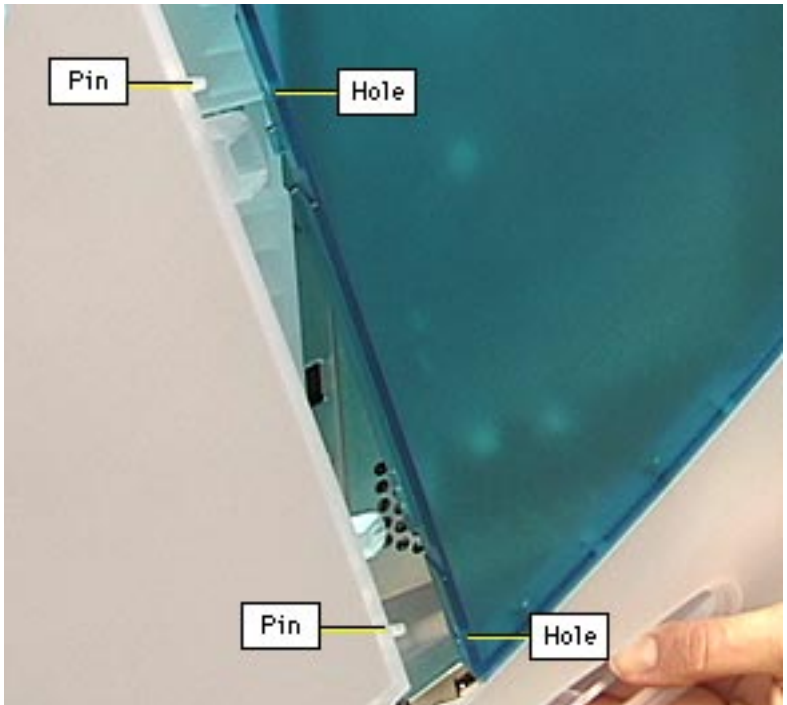


6 Wedge a popsicle stick or orange stick into the disengaged tab slot. Continue around the side and top of the rear housing—using the nail file or tweezers to disengage each tab—then place a popsicle stick or orange stick in the slot to keep the tab disengaged. Continue around the display until all six tabs are disengaged.



7 Pull the rear housing back and off of the display assembly.

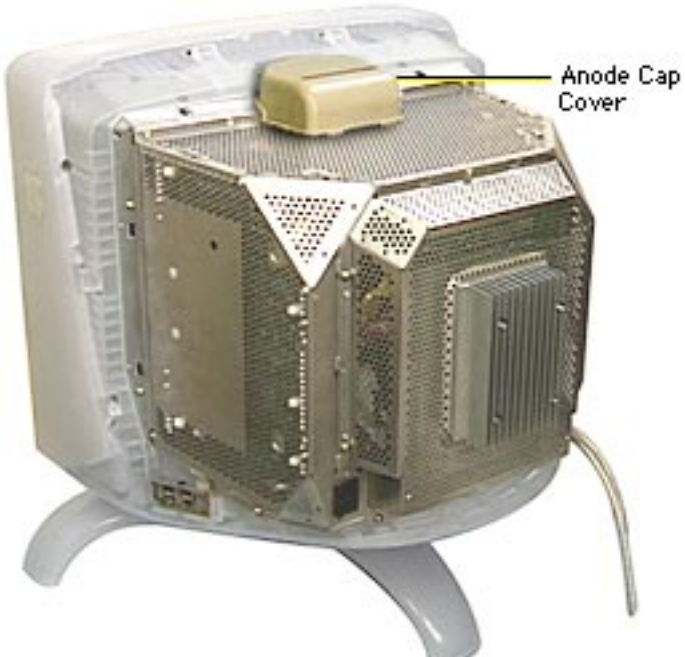
8 Route the video cable and USB cable through the back panel opening.



Replacement Note: As you position the rear housing onto the display assembly,

- Check the back of the display. Ensure the power adapter and video/USB cables are centered correctly with the rear housing openings.
- Then check each side of the rear housing. Line up the three integral pins on the display assembly with the holes in the rear housing.
- Check the top of the display. Line up the two pins near the center.

- When you are sure the rear housing is lined up correctly, face the display screen and reach around to the back of the rear housing. With both hands, press the rear housing onto the display assembly. You might need to strike the top of the rear housing, near the intermediate bezel, to snap it into place. Then replace the screws.

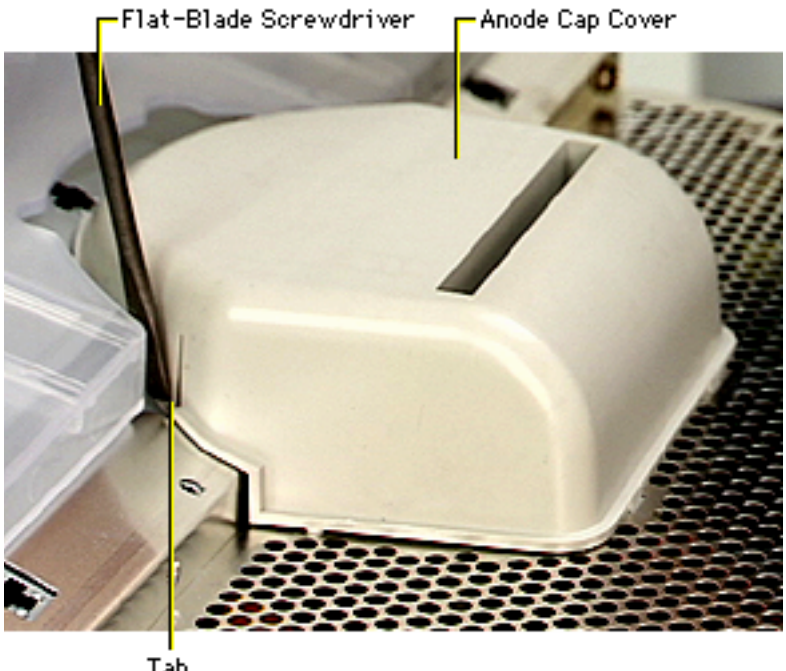


Discharging the CRT and Removing the Anode Cap

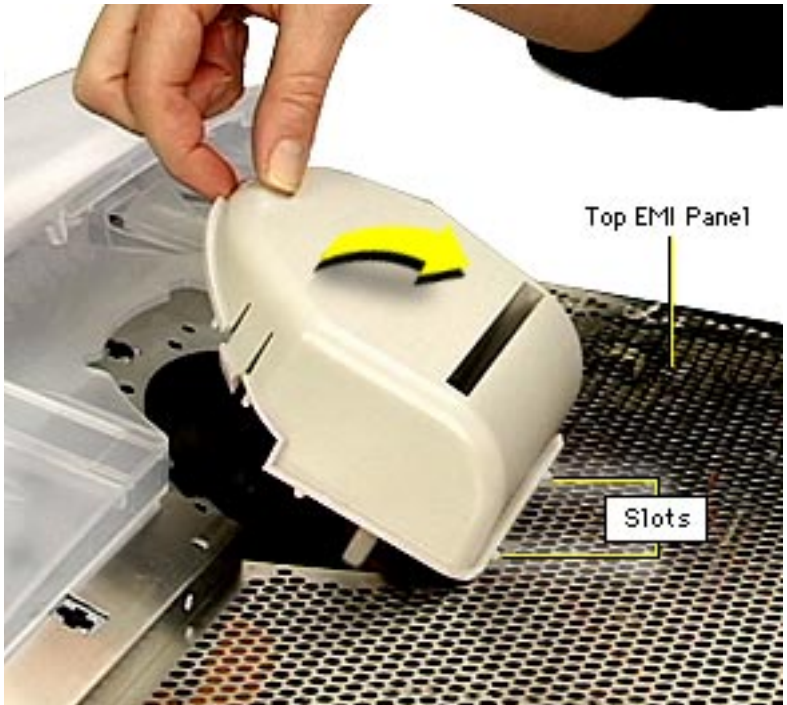
Before you begin, remove

- USB cover
- Rear housing

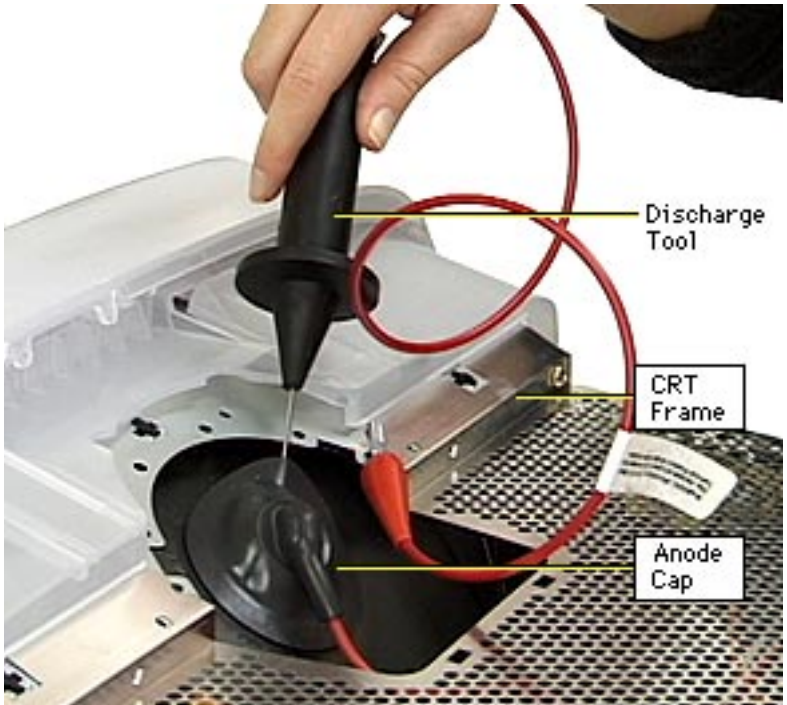
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety and read the safety guidelines at the beginning of this chapter.



1 Use a flat-blade screwdriver to press in on one of the side tabs on the anode cap cover. Lift up that side. Repeat for the other side.



2 Tilt up the anode cap cover and release it from the two back slots on the top EMI panel.



3 Using the CRT discharge tool (Apple part number 076-0381), connect the clip to the metal CRT frame and insert the needle underneath the anode cap to discharge the CRT.

4 Remove the anode cap from the anode aperture.

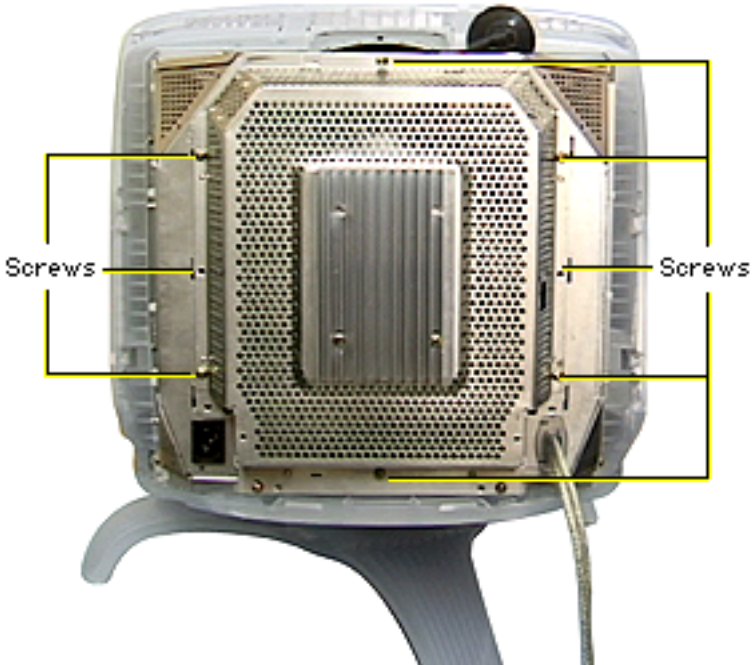
5 For working inside the monitor with the power off, establish an ongoing ground by using a cable with alligator clips at both ends. Connect one end to the anode aperture, and connect the other end to the metal CRT frame.

6 With the CRT discharged and the ongoing ground in place, wear a grounding wriststrap to prevent equipment damage from static electricity.

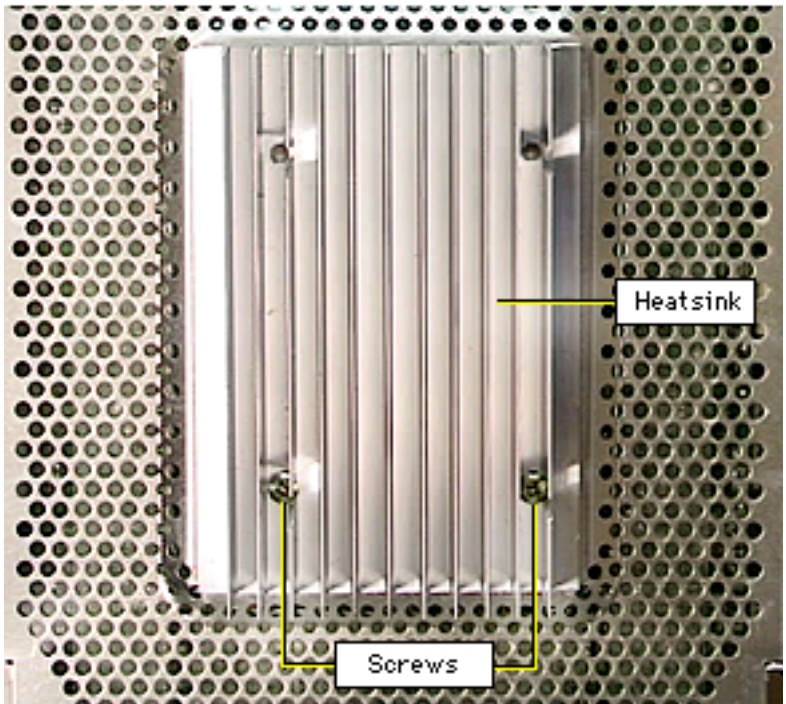
Back EMI Shield

Before you begin,

- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap



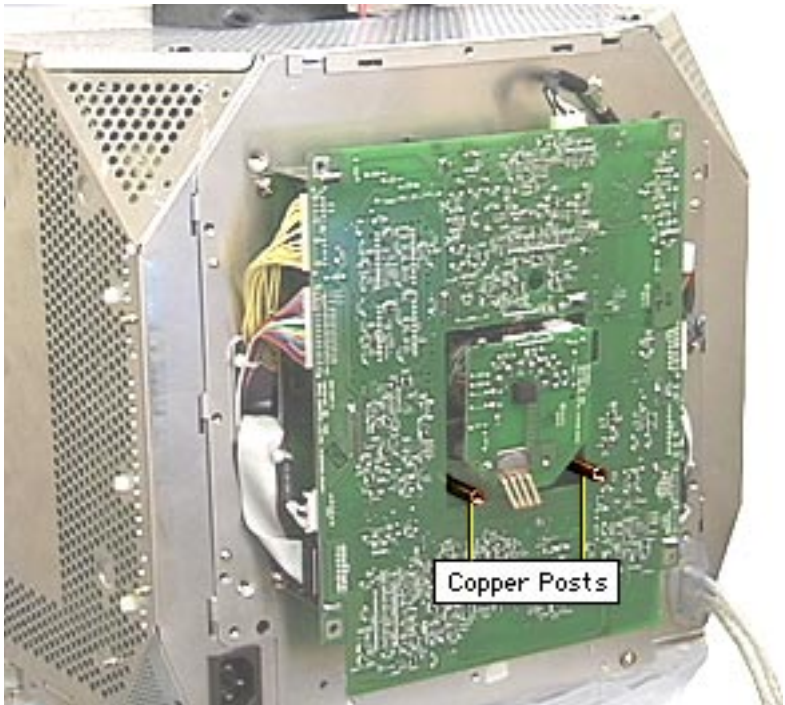
1 Remove the eight Phillips screws and star washers that surround the EMI shield.



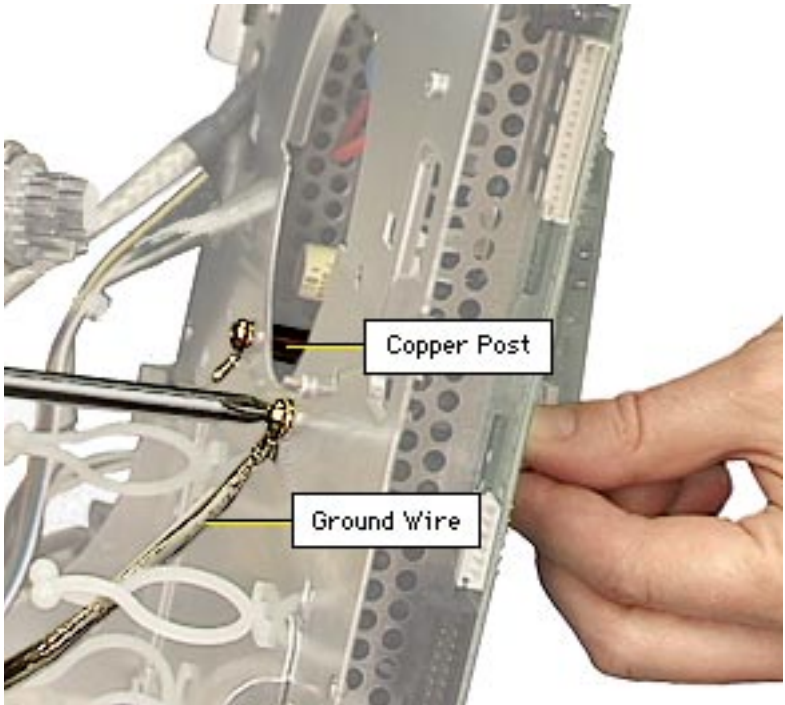
2 Remove the two lower Phillips screws that secure the heatsink to the back EMI shield and the copper posts inside the display assembly.

Replacement Note: The heatsink, included on earlier versions of the display, is not essential. So do not replace the heatsink, but do ensure the two screws still secure the back EMI shield to the copper posts.

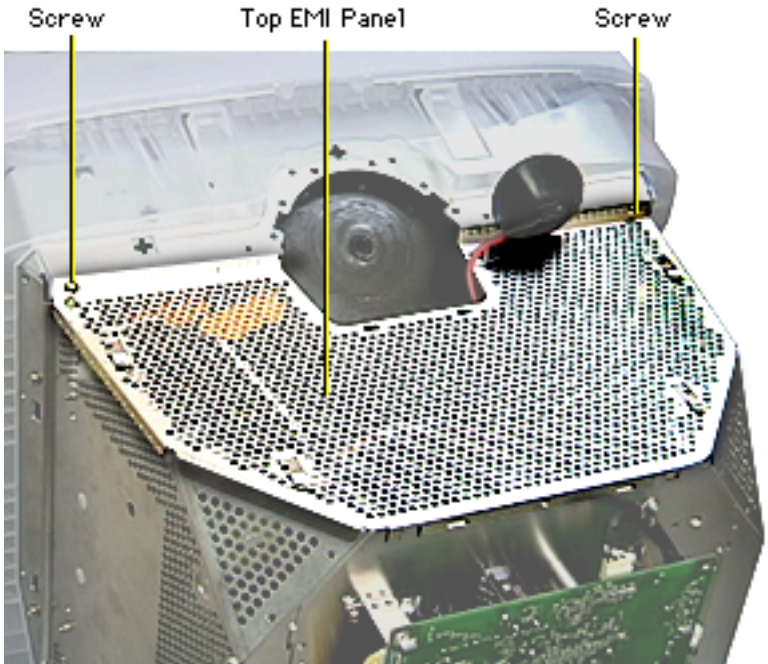
3 Pull off the back EMI shield from the rear of the CRT/video board.



Caution: On some units, removing the lower screws on the heatsink can cause the screws that secure the other end of the copper posts to become loose or fall inside the unit. Therefore, after the back EMI shield and top EMI panel are removed, check the screws at the copper posts inside to ensure no screws have become lost inside the unit.



Replacement Caution:
Secure the two inside screws at the metal shield to the copper posts first. Then avoid overtightening the outside screws at the back EMI shield. Overtightening the outside screws could potentially loosen the inside screws.

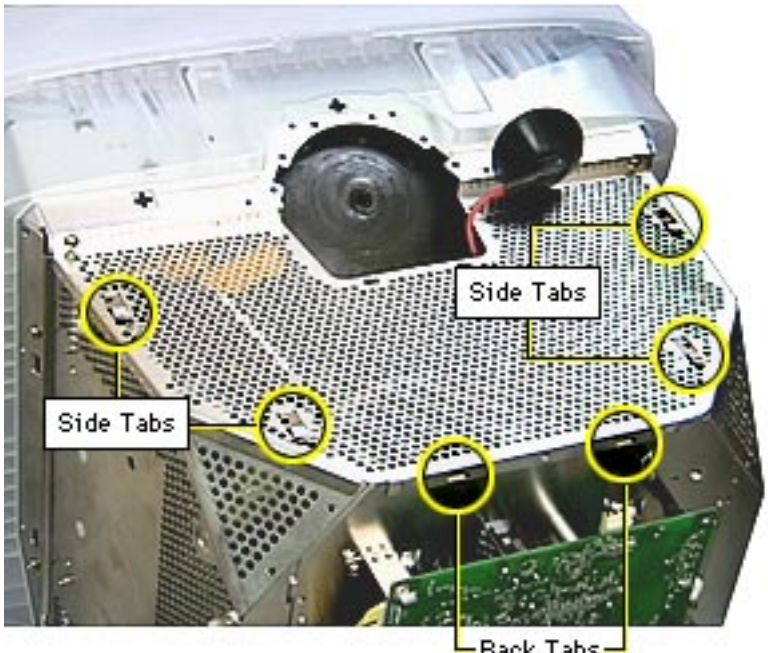


Top EMI Panel

Before you begin,

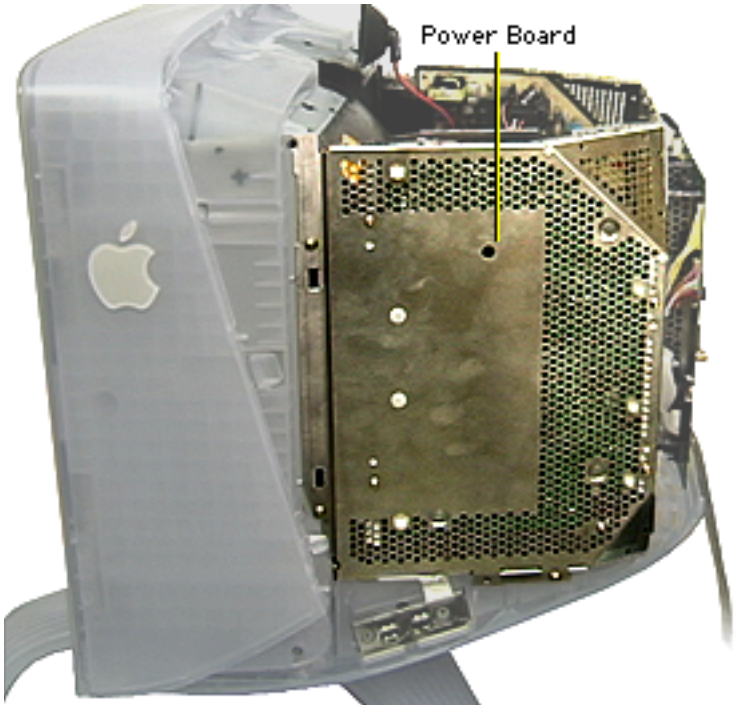
- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield

1 Remove the two Phillips screws (with star washers) from the top EMI panel.



2 Lift up the back of the top EMI panel until the two back tabs clear the slots.

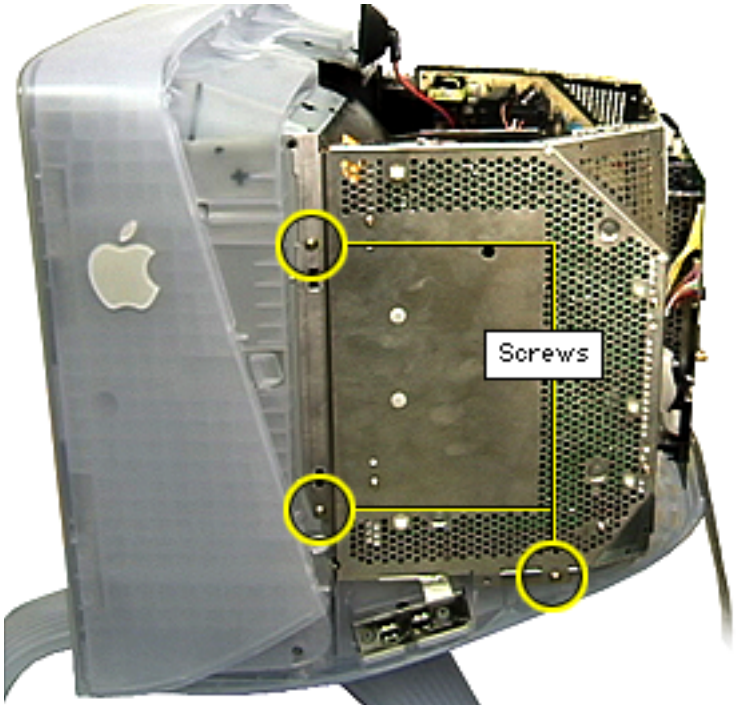
3 Holding the back of the EMI panel up, pull it back to slide clear of the side tabs.



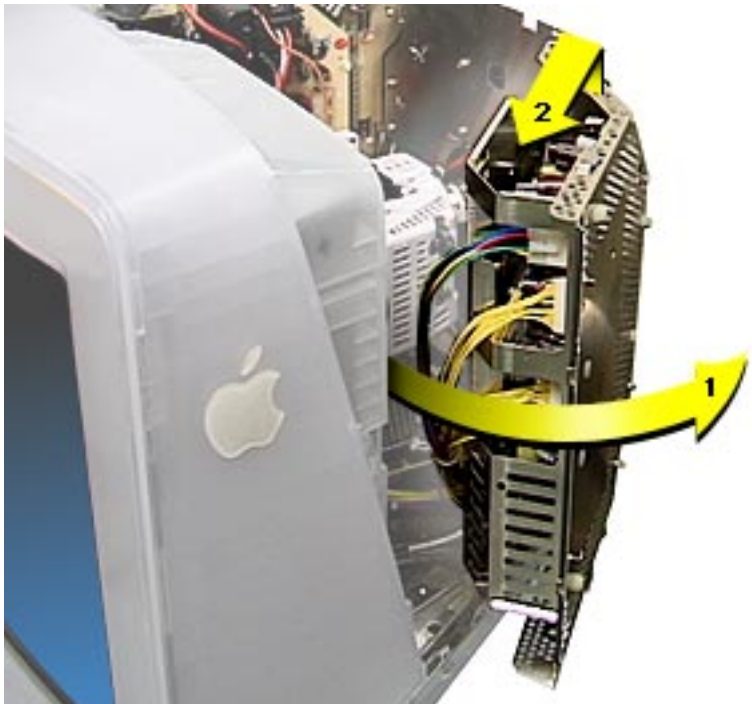
Power Board

Before you begin,

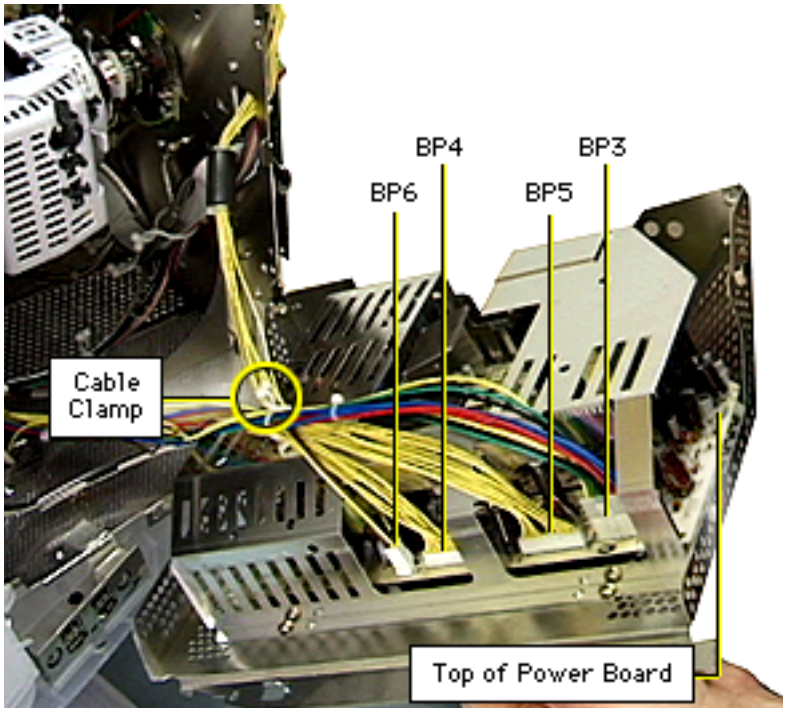
- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield
- Remove top EMI panel



1 Remove the three Phillips screws and star washers that secure the power board's shield to the display assembly.

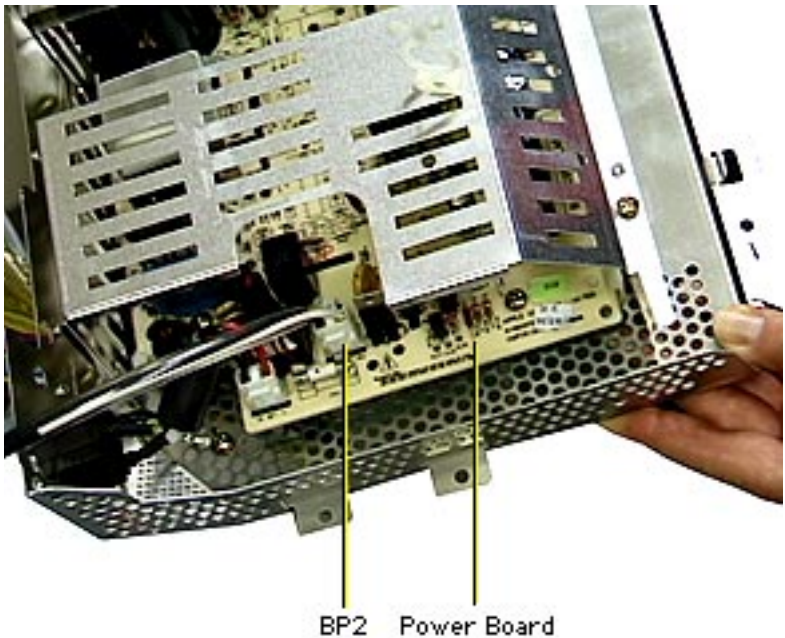


2 Swing out the power board on its hinges. Then lift it up and move it off the hinge hooks.



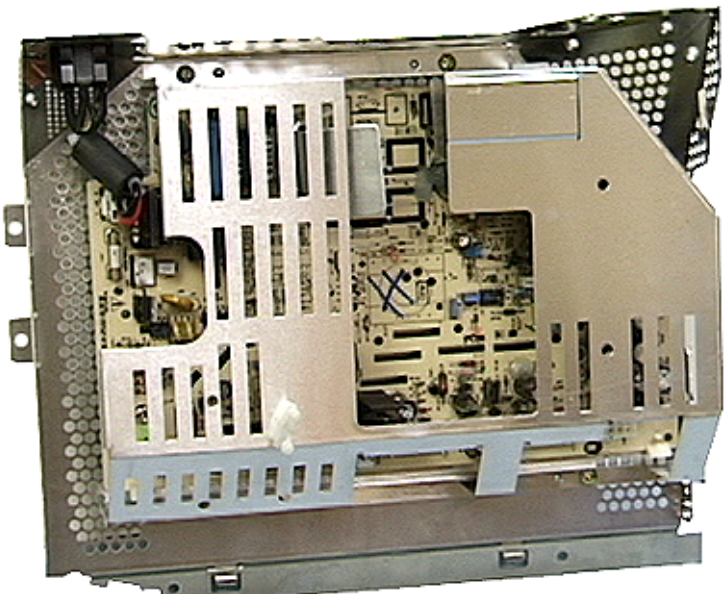
3 Open the cable clamp, and disconnect the following cables:
- 2-pin locking connector from BP6
- 9-pin connector from BP4
- 12-pin connector from BP5
- 10-pin locking connector from BP3

Replacement Note: Depending on when the unit was made, the power board can have up to three cable clamps.



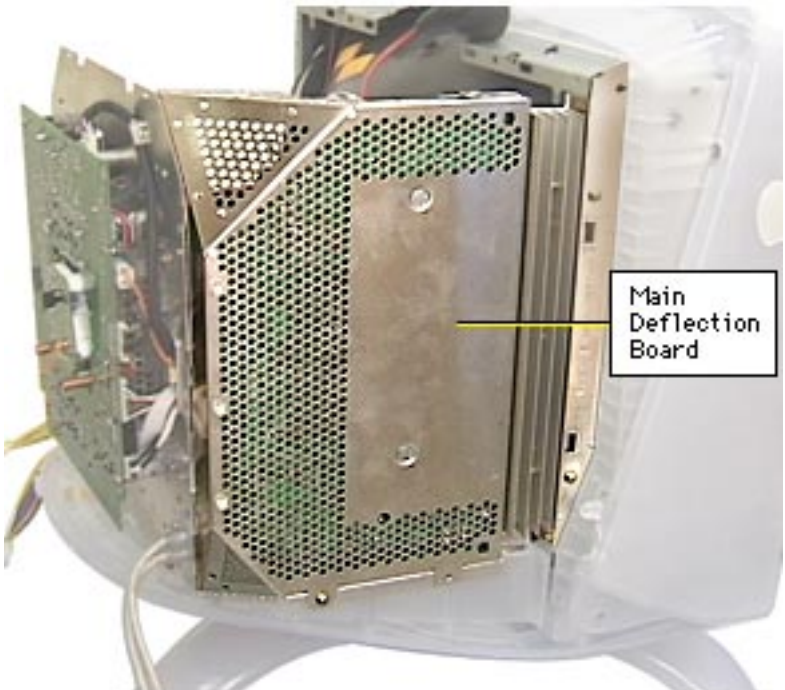
4 Disconnect 2-pin locking connector BP2, located at the bottom of the power board by the fuse.

5 Remove the power board from the display assembly.



Replacement Note: The power board part includes no detachable cables.

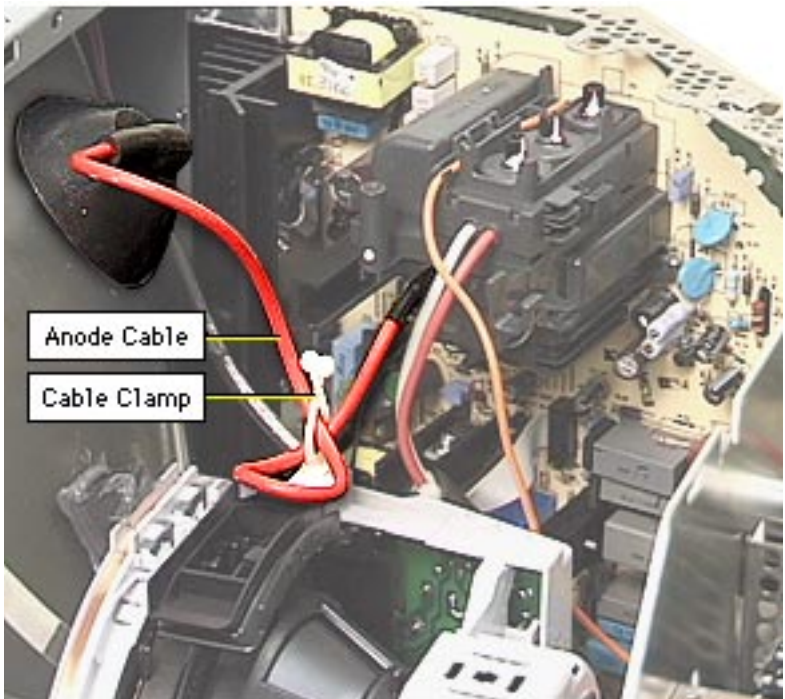
Replacement Note: Refer to the illustration “Detachable Cables: Power Board and CRT/Video Board” in the Exploded View chapter.



Main Deflection Board

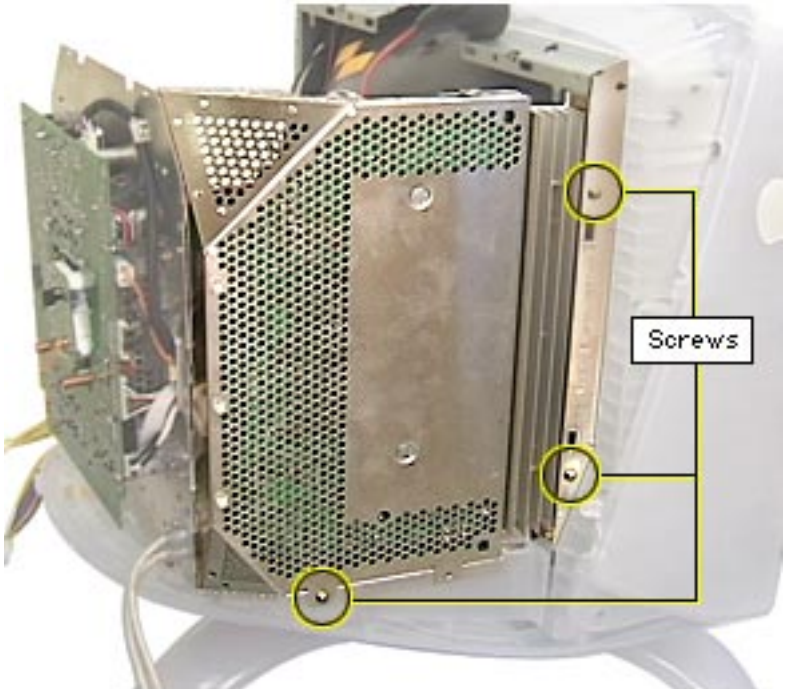
Before you begin,

- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield
- Remove top EMI panel

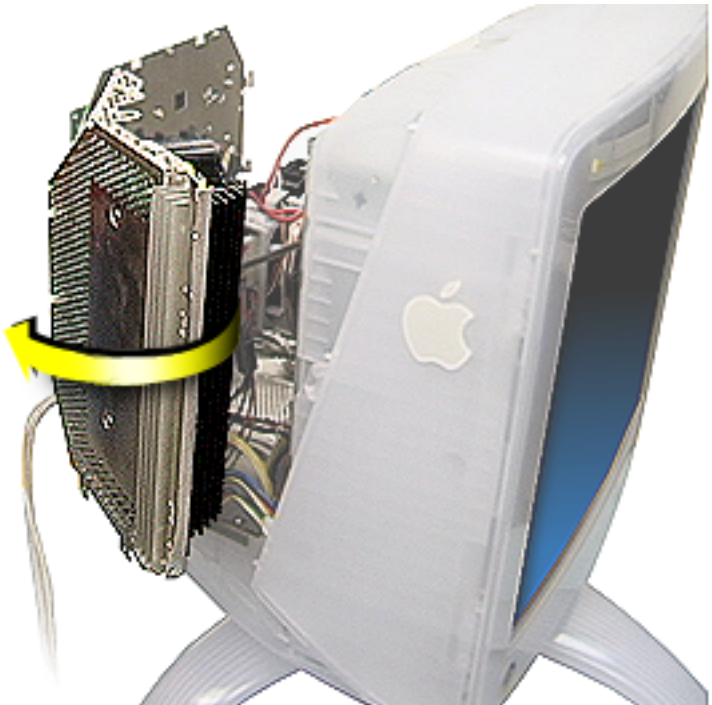


1 Open the cable clamp that secures the anode cable to the plastic yoke on the CRT.

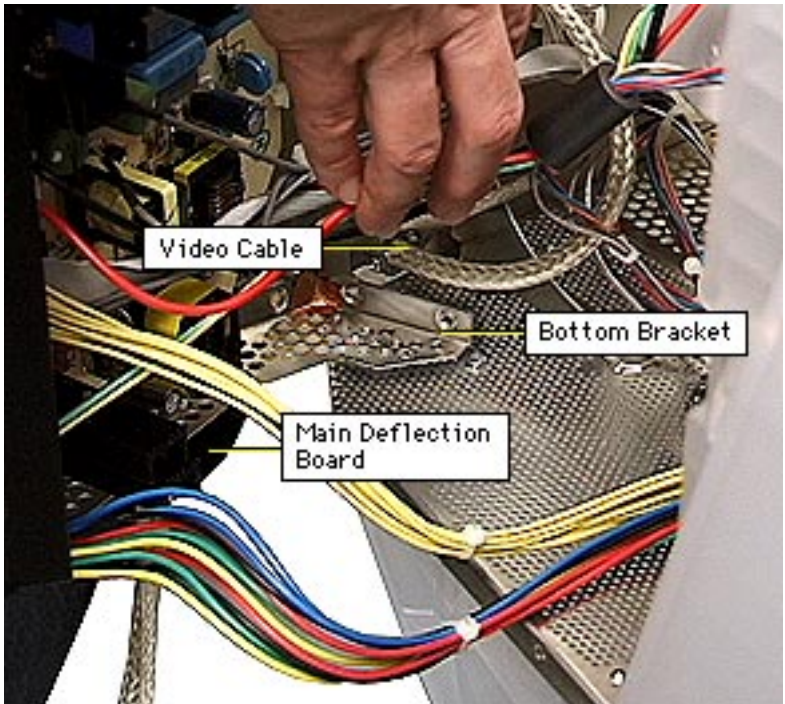
2 Refer to “CRT/Video Board” in this chapter to remove the red and white focus wires from the CRT socket.



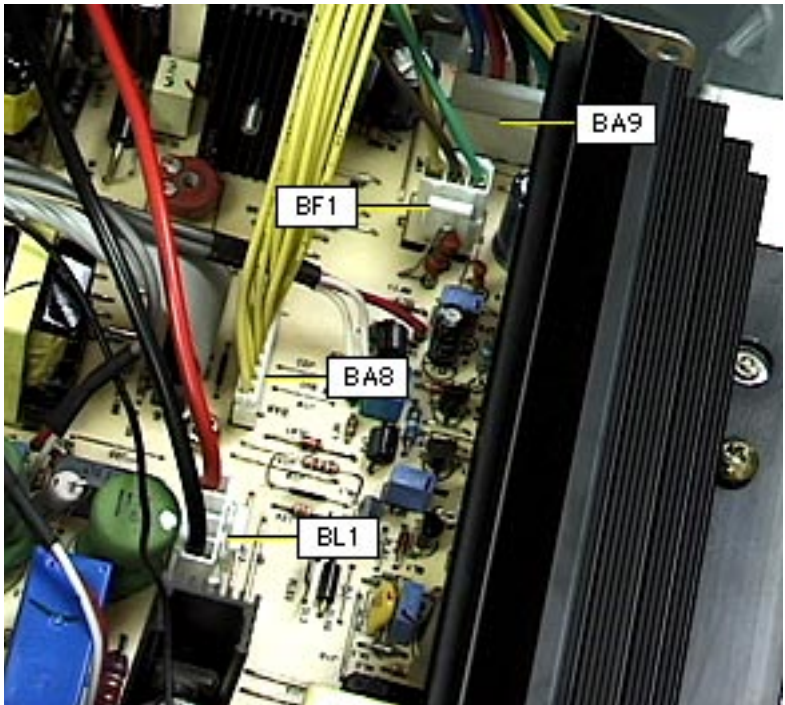
3 Remove the three Phillips screws and star washers that secure the main deflection board shield to the display assembly.



4 Gently swing out the board on its hinges.

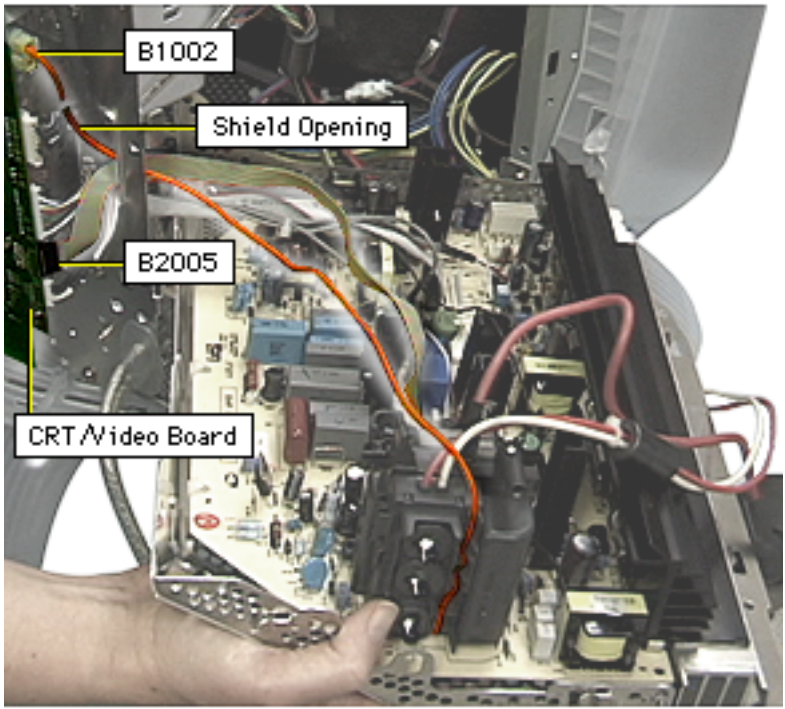


5 Swing out the main deflection board far enough until you can see that the bottom bracket at the inside corner clears the video cable at its strain relief.



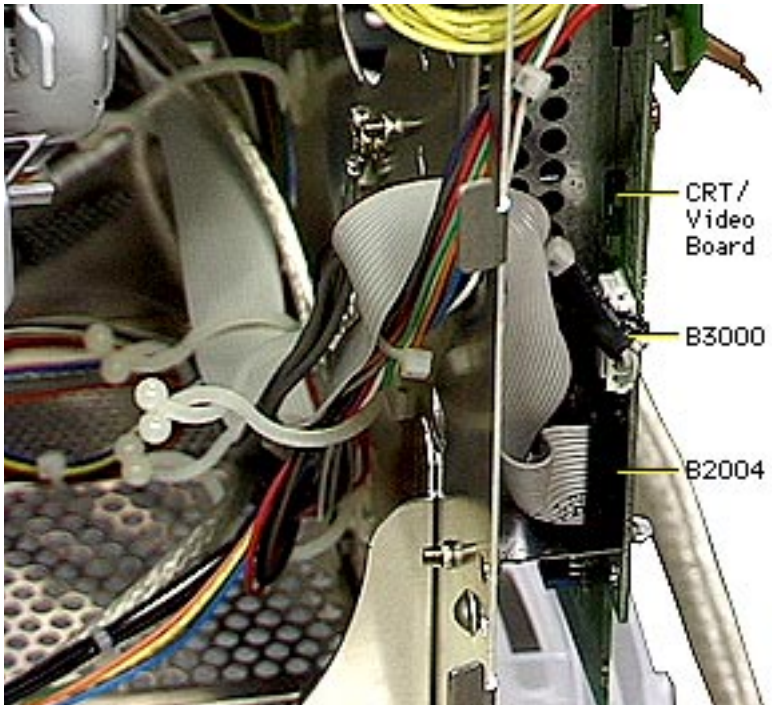
6 Lift up the main deflection board and move it off the three hinge hooks.

7 While supporting the board, disconnect
- 10-pin locking connector from BA9 (to power board)
- 3-pin locking connector BF1 (to yoke)
- 9-pin connector BA8 (to power board)
- 2-pin locking connector BL1 (to yoke)



8 Without straining the remaining cables, disconnect these cables from the right side of the CRT/video board:
- Orange wire from B1002
- 10-pin ribbon cable from B2005

9 Route the cables through the shield opening of the CRT/video board.

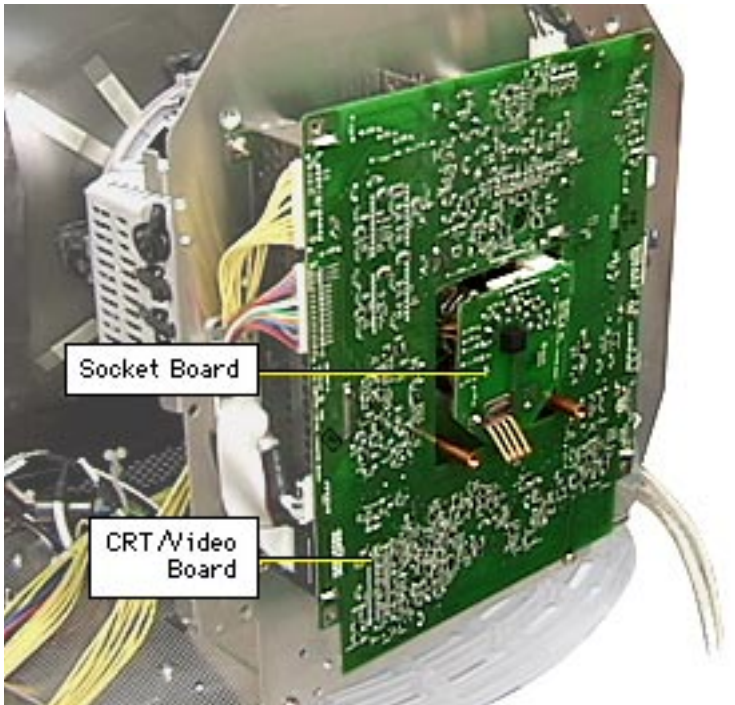


10 Open the cable clamps on the interior side of the CRT/video board shield, and remove the remaining ribbon cable (B2004) and the ferrite bead connector cable (B3000) from the left side of the CRT/video board.

11 Remove the main deflection board from the display assembly.

Replacement Note: The main deflection board module appears as shown and includes soldered cables, but no detachable cables. (You can order a cable kit, Apple part number 076-0765, if any of the detachable cables need to be replaced.)

Replacement Note: Refer to the illustration “Detachable Cables: Main Deflection Board and CRT/Video Board” in the Exploded View chapter.



CRT/Video Board

Note: The CRT/video board includes a central socket board and a larger board.

Before you begin,

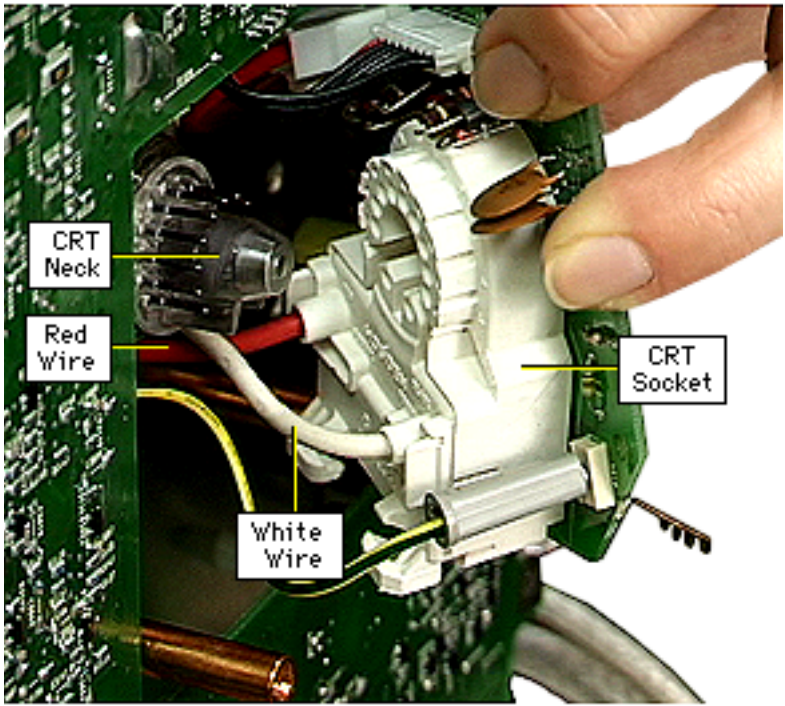
- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- **Important:** Download the setup parameters if replacing the CRT/video board with a new board (refer to the Adjustments chapter)
- Remove back EMI shield

- Remove top EMI panel
- Remove power board
- Remove main deflection board

Caution: To avoid loss of data, you must download the display parameter settings before replacing the CRT/video board with a new board. However, you do not have to download the setup parameters if you are removing the board for another procedure and will install the same board.

Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

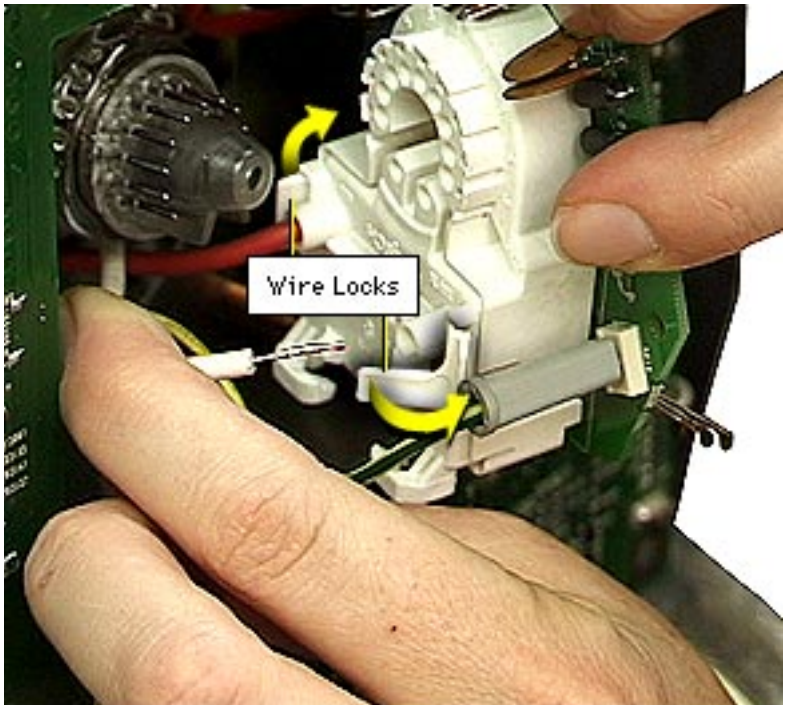
Caution: Never use a grounding wriststrap until after discharging the CRT. When disconnecting cables from the CRT/video board, be careful not to apply excessive pressure to the CRT neck.



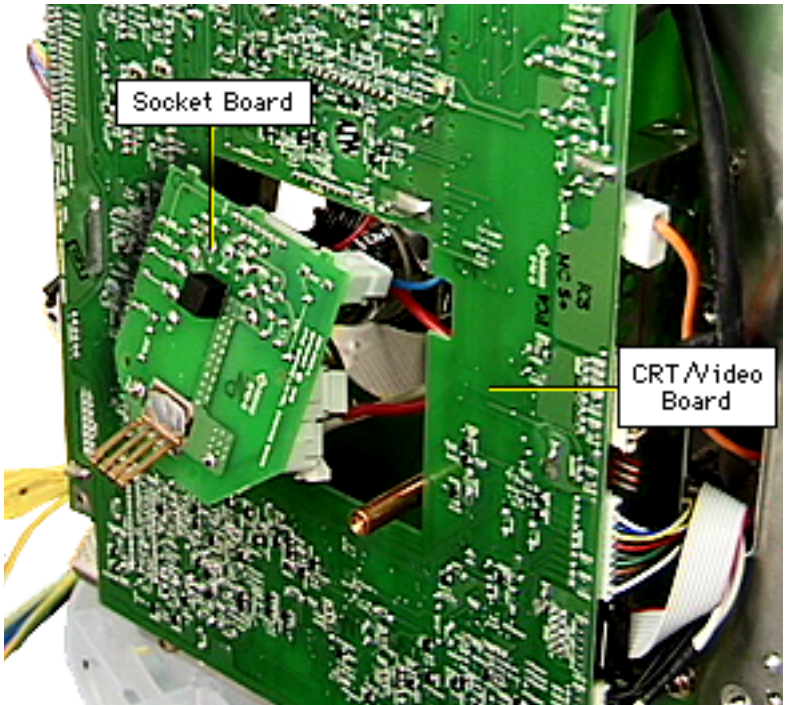
1 Holding the side edges of the central CRT/video board, gently pull and rock the board until it comes off the CRT neck.

2 **Note:** The only cables to disconnect from the central CRT/video board are the red and white focus wires.

Without straining cables, tilt the board slightly until you can reach the red and white focus wires at the CRT socket.



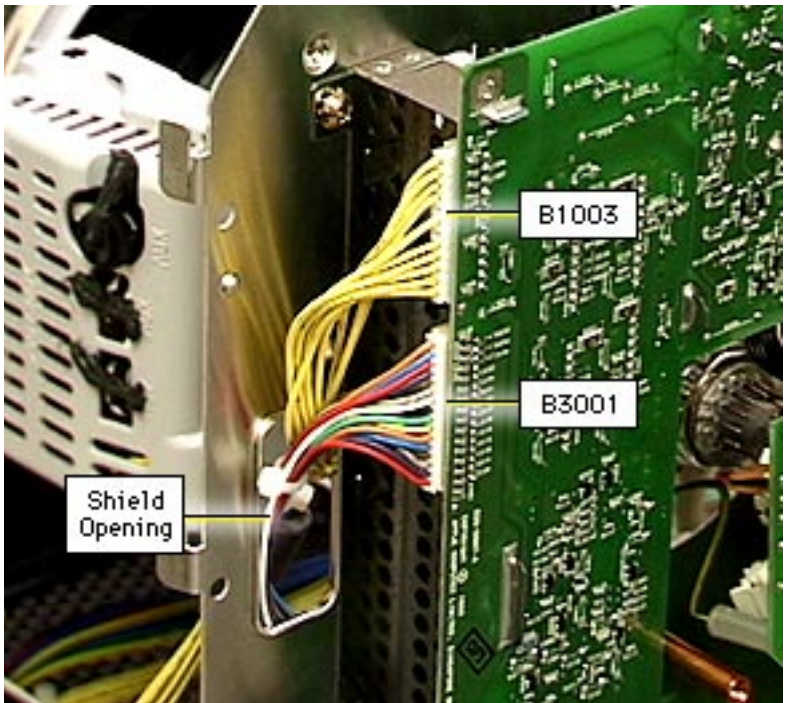
3 Each wire is secured in the socket by a hinged wire lock. Press outward (away from the socket) on the locking tab to release the wire lock. Pull out the wire. Repeat for the other wire.



4 Allow the socket board to rest against the CRT neck.

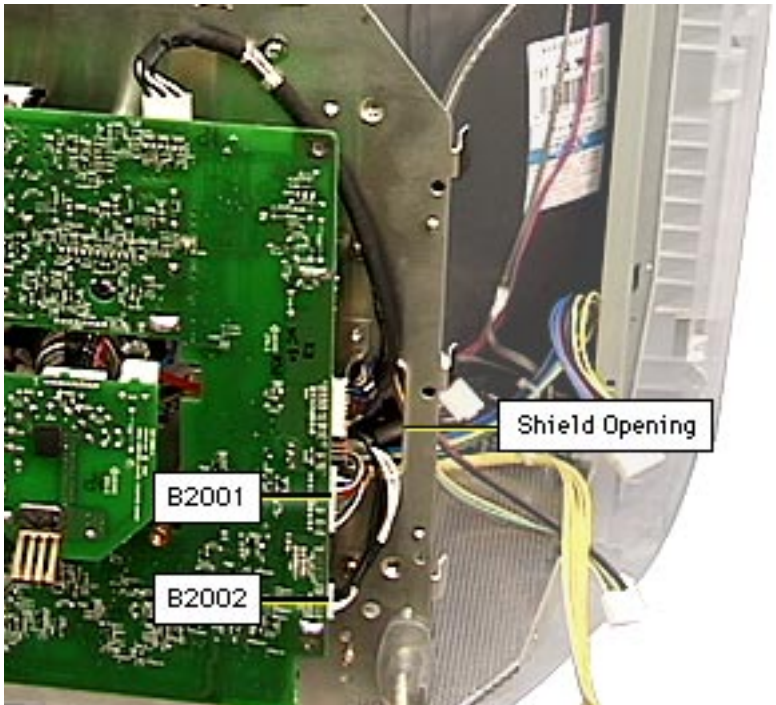
Replacement Note: Raised lettering on the CRT socket indicates the location of the focus wires. “Red” indicates the lock for the red wire; “Black” represents the lock for the white wire.

With the lock open, push the wire all the way in as far as it will go. Close the lock and tug at the wire to make sure it is secure. If there is any movement, open the lock and reinsert the wire until it is securely connected.



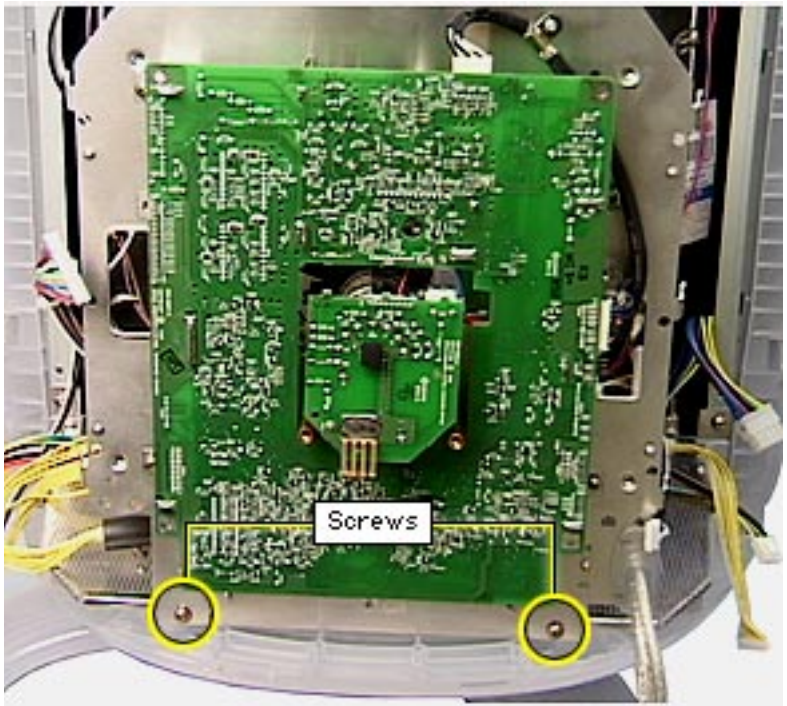
5 From the left side of the board, disconnect
- 12-pin connector from B1003
- 16-pin connector from B3001

6 Push the cables through the shield opening.

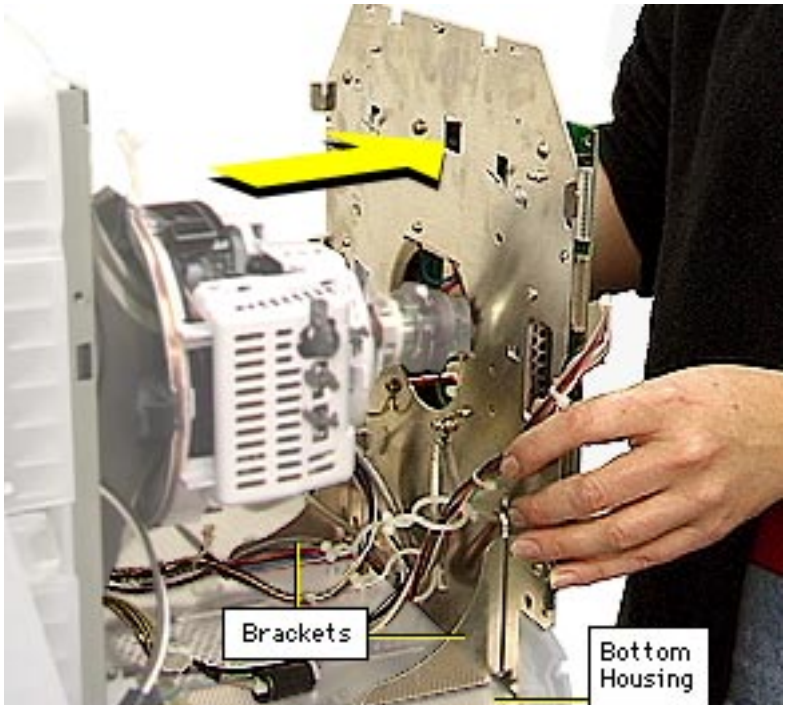


7 From the right side of the board, disconnect
- 10-pin connector from B2001
- 6-pin connector from B2002

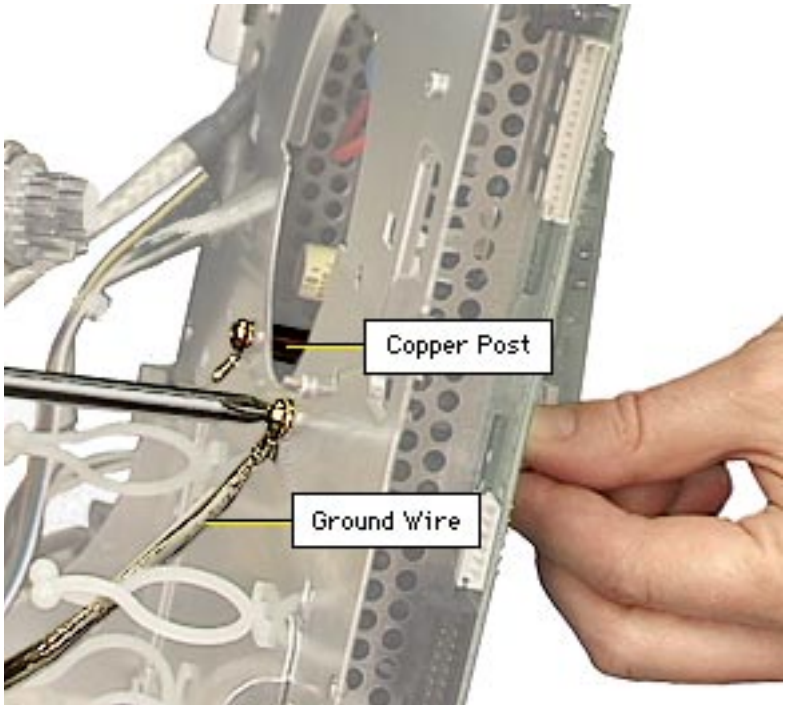
8 Push the cables through the shield opening.



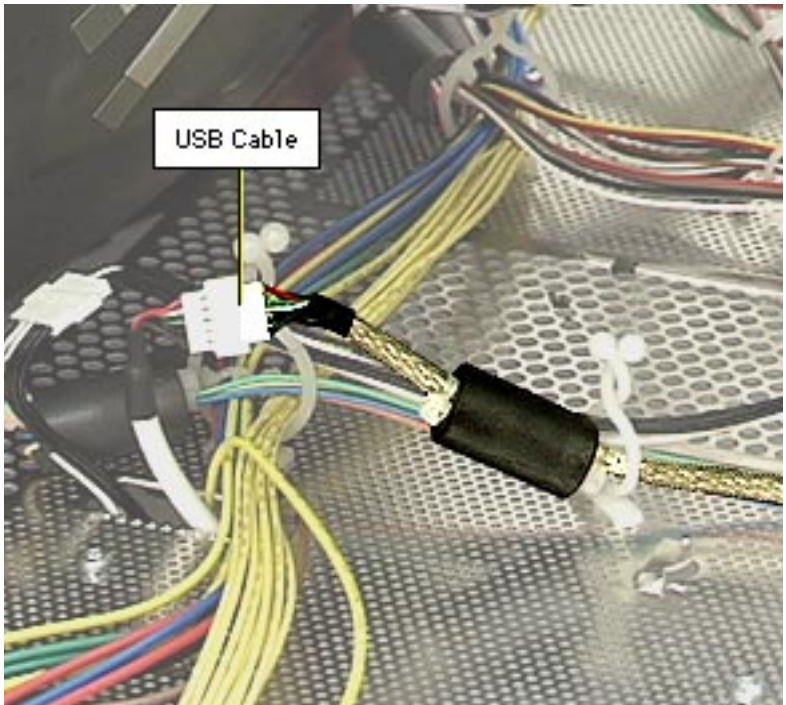
9 Remove the two Phillips screws and star washers at the bottom corners of the CRT/video board shield.



10 Pull the board shield straight back until its two metal brackets are released from the bottom housing.



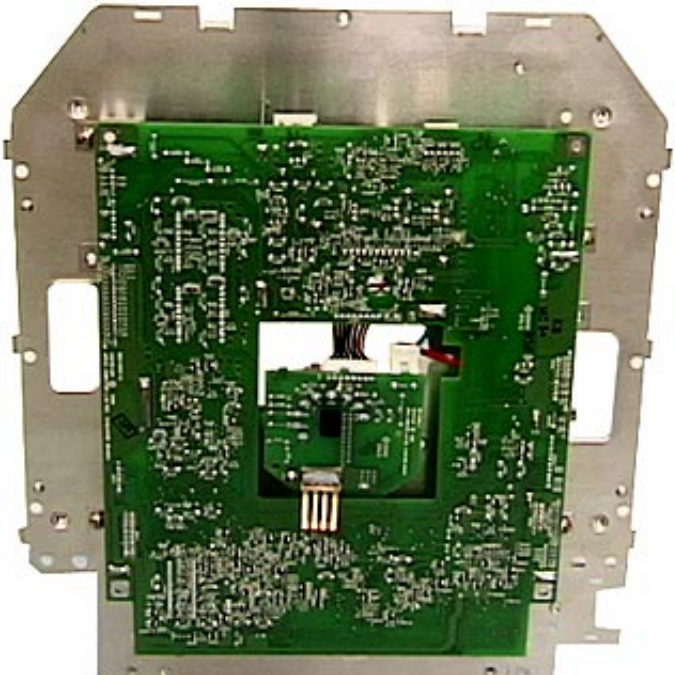
11 At the two copper posts, remove
- Phillips screw (and lug) that connects to the shield
- Phillips screw that connects the shielded ground wire lug (from the CRT ground strap) to the shield



12 Disconnect the USB cable at the bottom housing connector.

13 Release the remaining cables from the cable clamps.

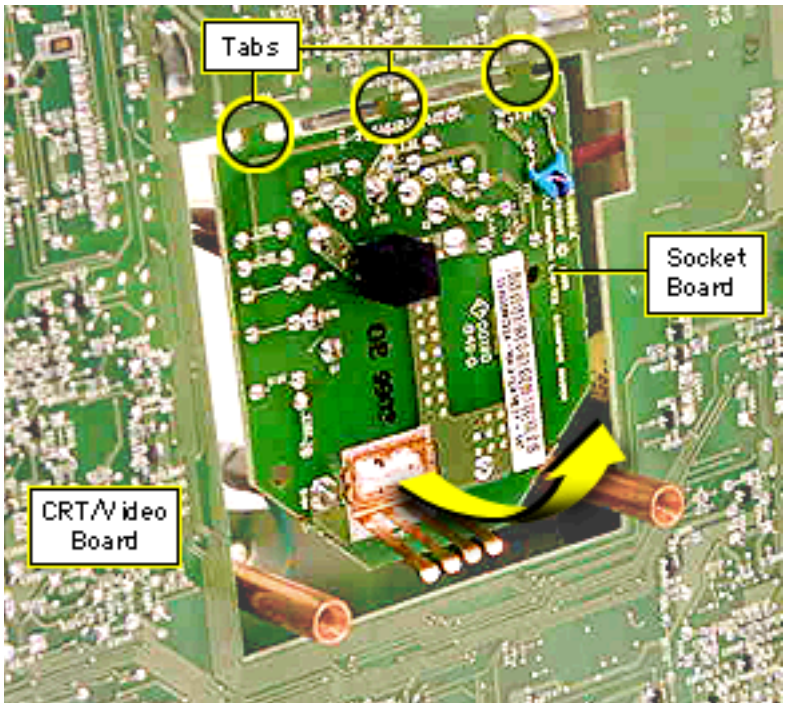
14 Refer to “Video Cable” in this chapter to remove the video/USB cable from the CRT/video board shield.



Replacement Note: There are two versions of the CRT/video board. You must verify the version and replace boards like for like. Refer to “Two Versions of the CRT/Video Board” in the Troubleshooting chapter.

Replacement Note: The CRT/video board includes the main CRT/video board, the central socket board, and the metal shield. It includes no detachable cables.

Replacement Note: Refer to the two illustrations



showing detachable cables for the CRT/video board in the Exploded View chapter.

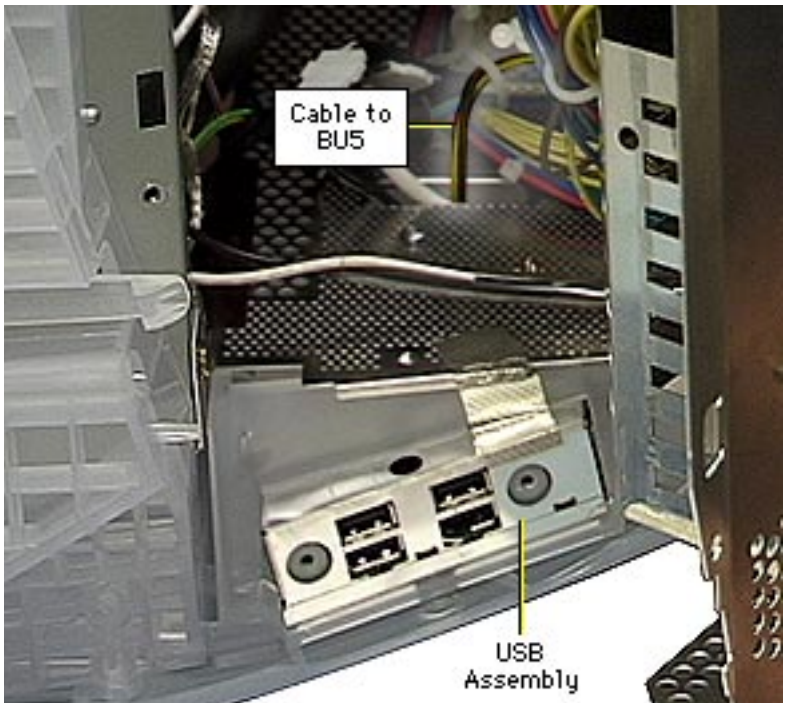
Replacement Note: Out of the box, a new CRT/video board part includes the central socket board attached to the main CRT/video board by three tabs.

To separate the boards, grasp the socket board by its edges and tilt it up until the three tabs break. You must break the tabs to correctly install the new board.

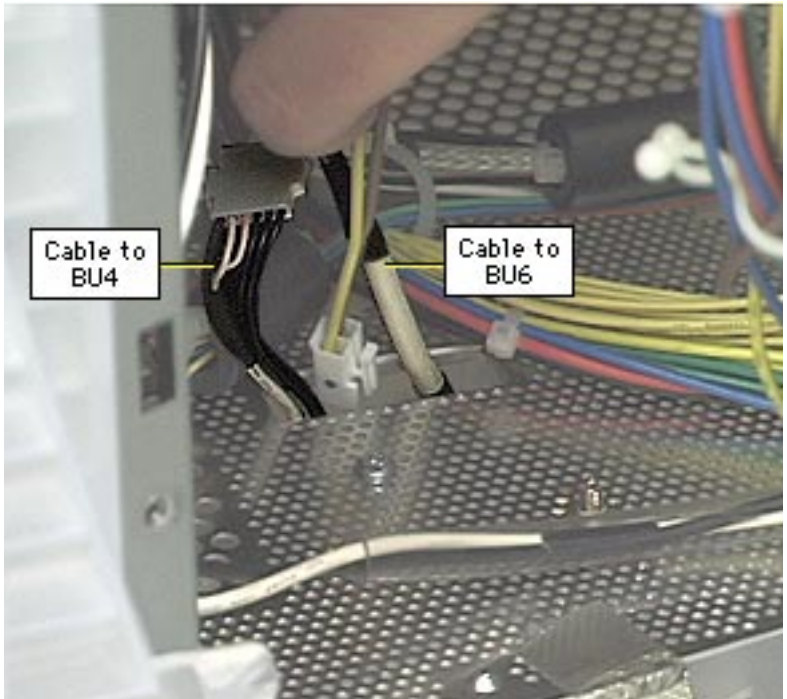
USB Assembly

Before you begin,

- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield
- Remove top EMI panel

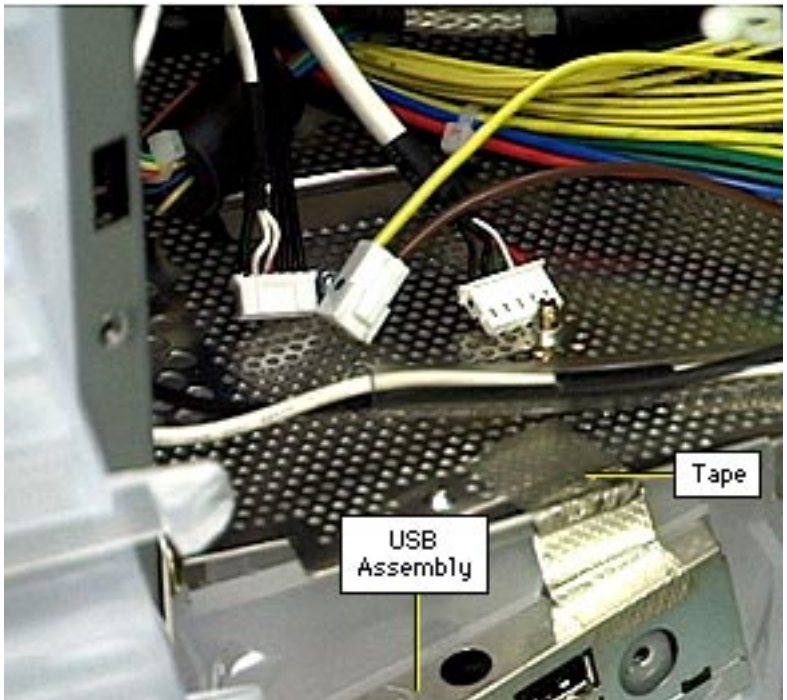


1. Refer to “Power Board” in this chapter to remove the three Phillips screws at the power board.
2. Swing out the power board on its hinges so you can access the three USB cables at the bottom housing.
3. Using a flat-blade screwdriver or a needlenose pliers, disconnect 2-pin locking connector BU5 at the USB board.



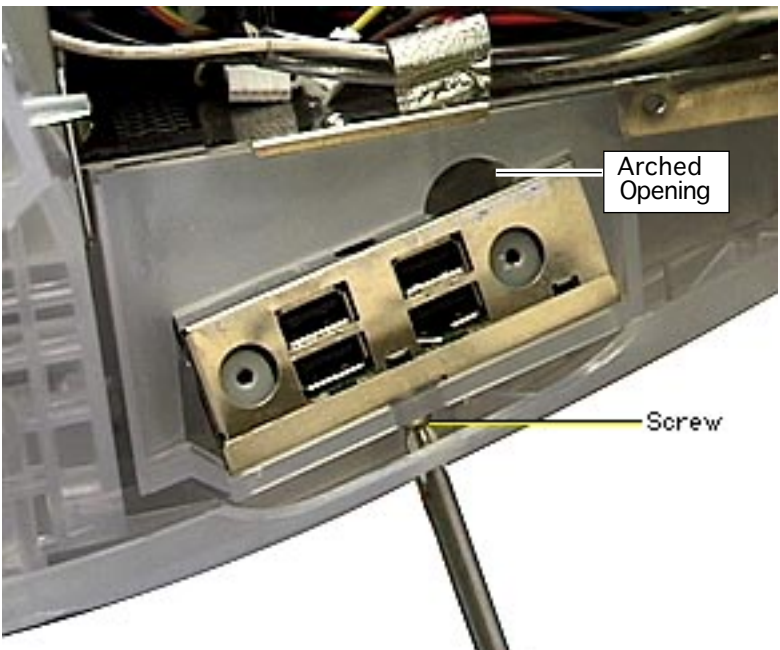
4 Disconnect the two remaining USB cables at the USB board:
- 5-pin connector BU6
- 6-pin connector BU4

Replacement Caution: When replacing the three USB cable connectors, ensure the connectors are seated properly and there is a tight fit. Secure the cables in a cable clamp so they are not dislodged during transportation of the display.



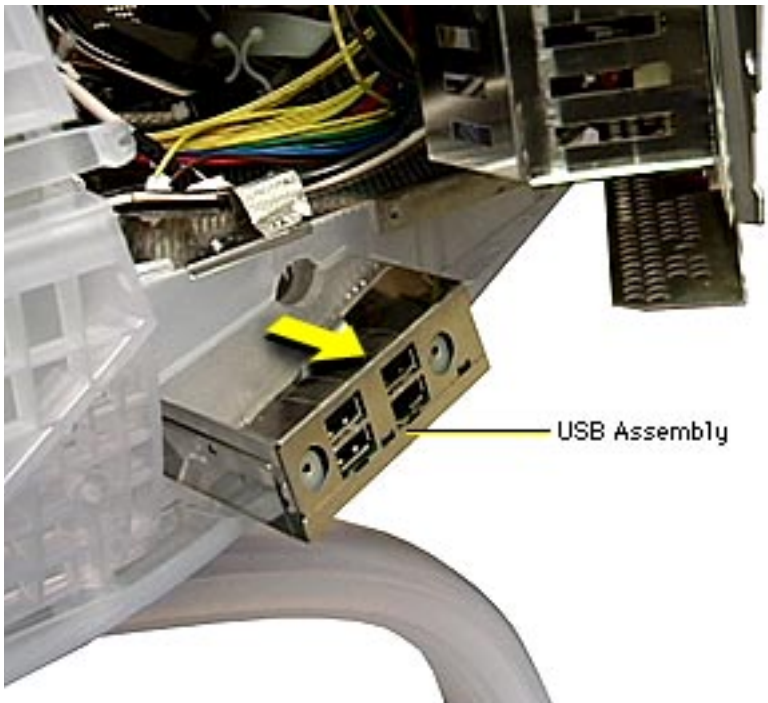
5 Peel back the metallic tape so it is not touching the USB assembly.

Replacement Caution: When replacing the USB assembly, ensure the metallic tape is securely reattached to the bottom housing and the USB assembly.



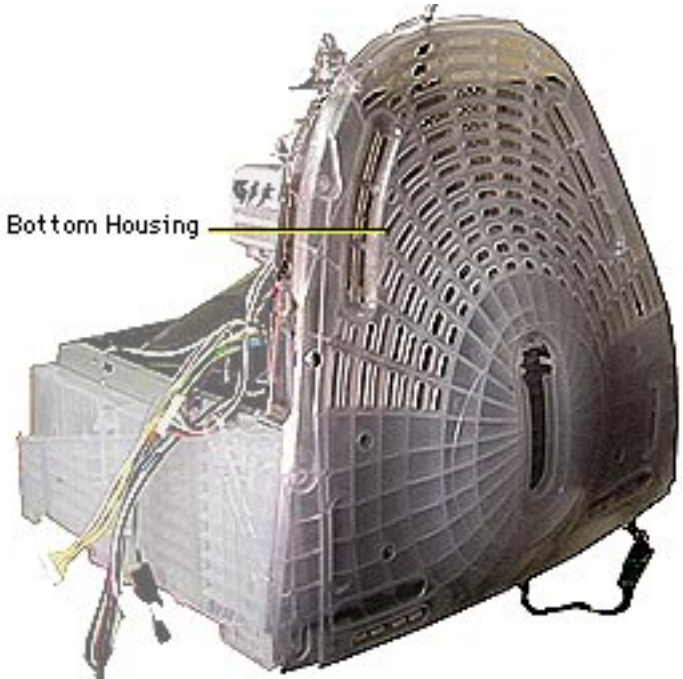
6 Use a Phillips screwdriver to disconnect the one screw and star washer that holds the USB assembly to the plastic housing.

7 Slowly slide out the USB assembly part way until it catches on the metal ground clip that touches the USB assembly from the interior bottom shield. Insert an orange stick to hold aside the ground clip.



8 Slide out the USB assembly the rest of the way.

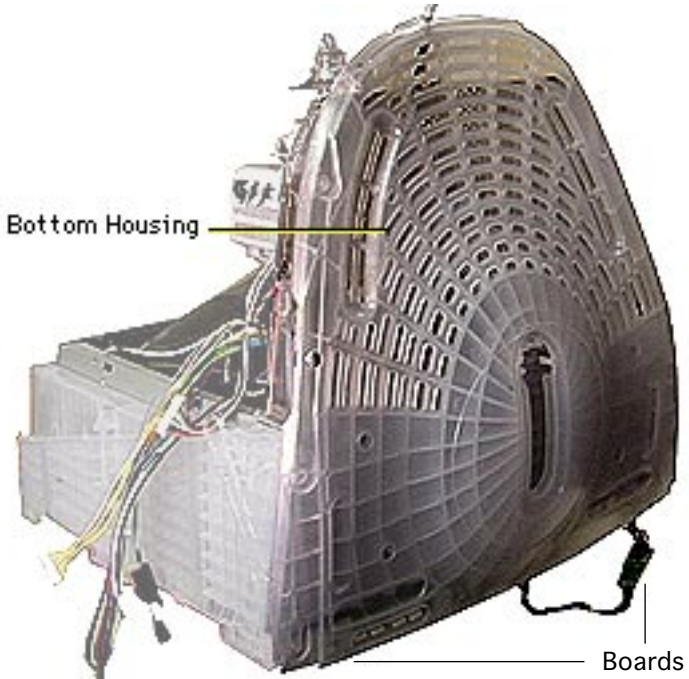
Replacement Note: When the USB assembly is reinstalled, use needlenose pliers to replace the three cable connectors, and ensure their tight fit. Also ensure the metallic tape adheres to both the bottom housing and the USB assembly.



Bottom Housing

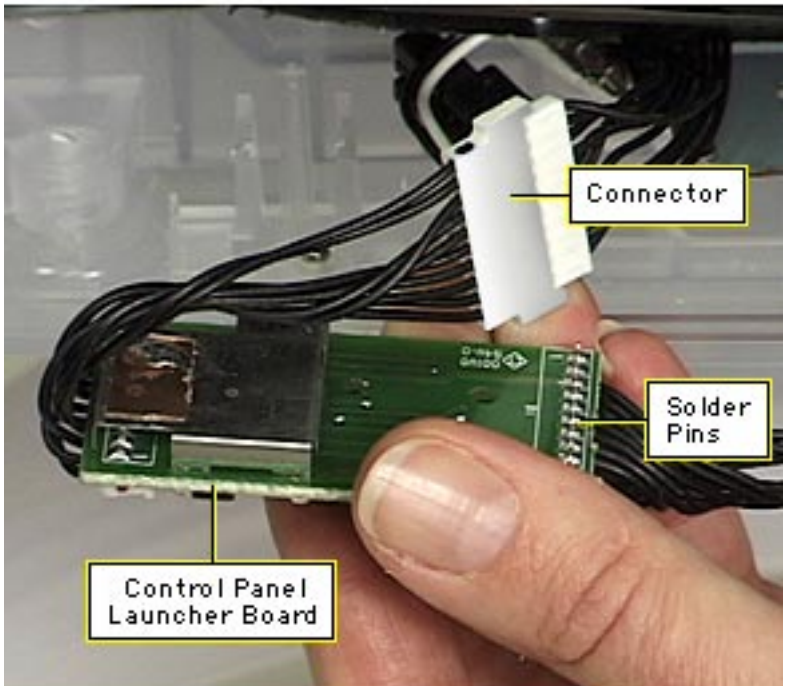
Before you begin,

- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield
- Remove top EMI panel
- Remove power board
- Remove main deflection board
- Remove CRT/video board
- Remove tripod stand



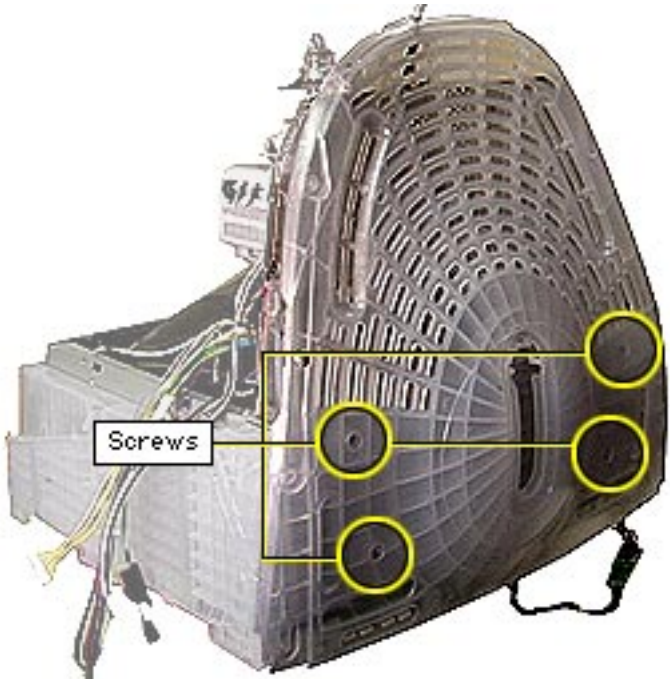
1 Refer to “User Controls Board” to remove the two end boards from their plastic holders. Do not remove the center board. Allow the two end boards to hang from their cables.

Caution: If you do not disconnect the two end boards, they can be damaged during this procedure.

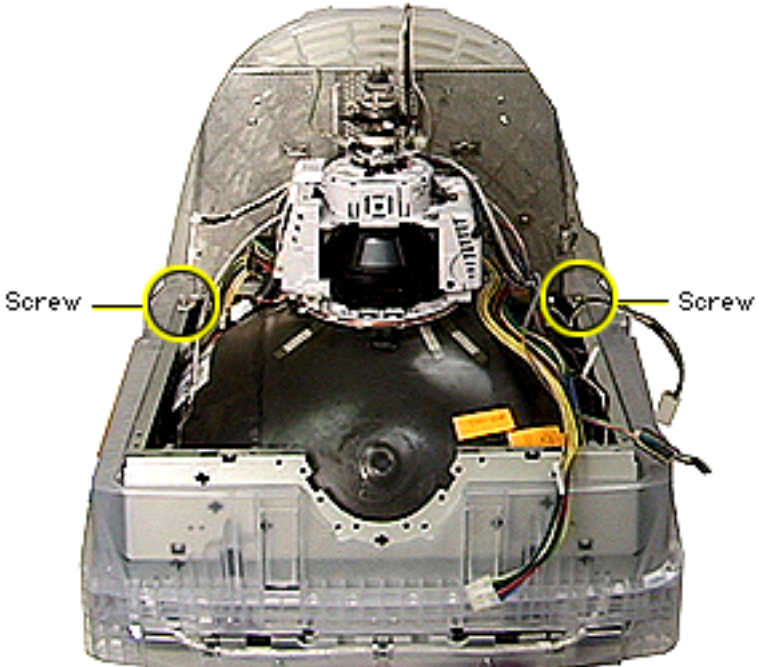


2 Disconnect the cable connector behind the control panel launcher board.

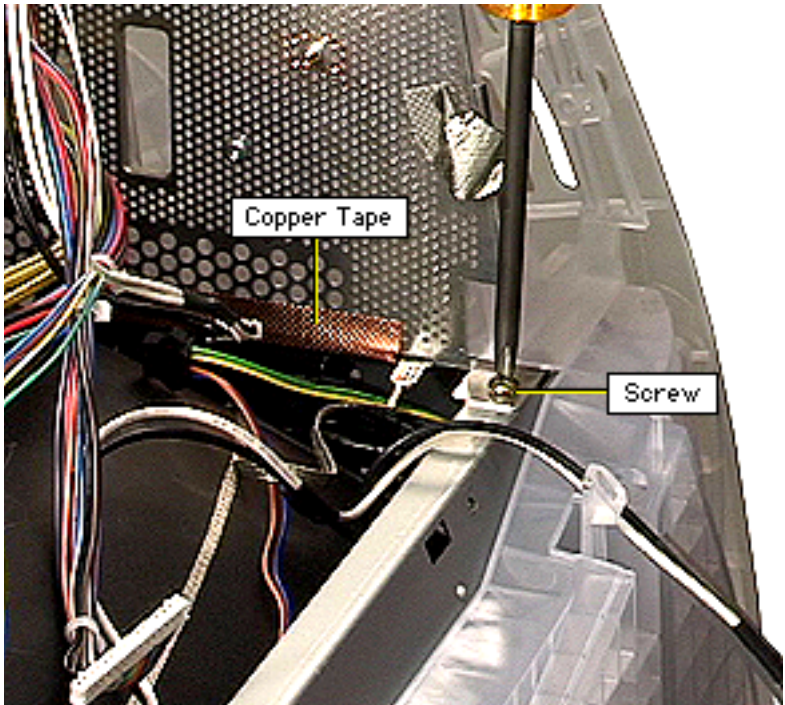
Replacement Caution: The connector has metal contacts on one side. To prevent an electrical short, ensure the cable to the connector is twisted so that the contacts do not touch the solder pins on the board.



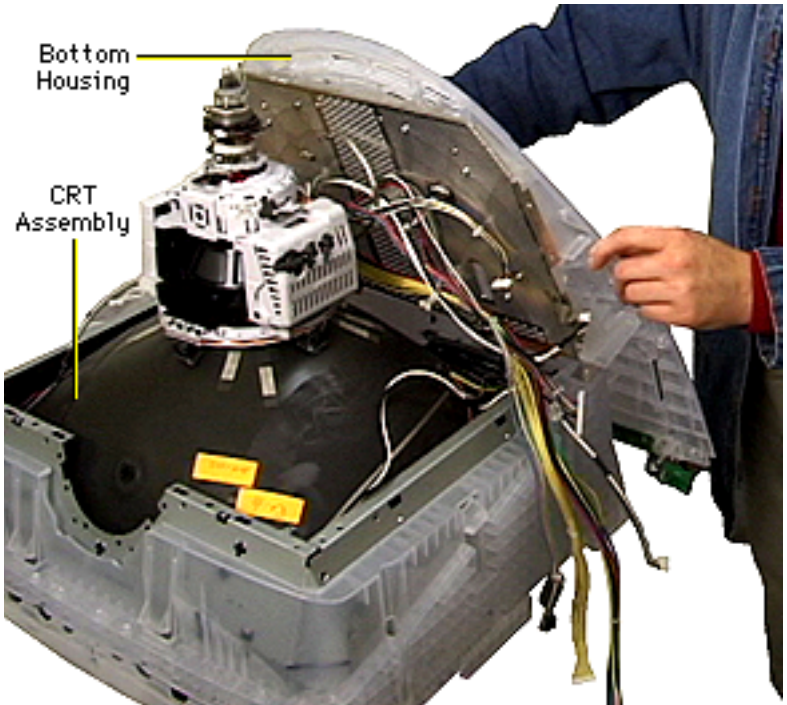
3 Place the display face-down on a padded surface and remove the four T-15 torx screws from the bottom housing.



4 Locate the two Phillips corner screws that connect to the CRT frame.

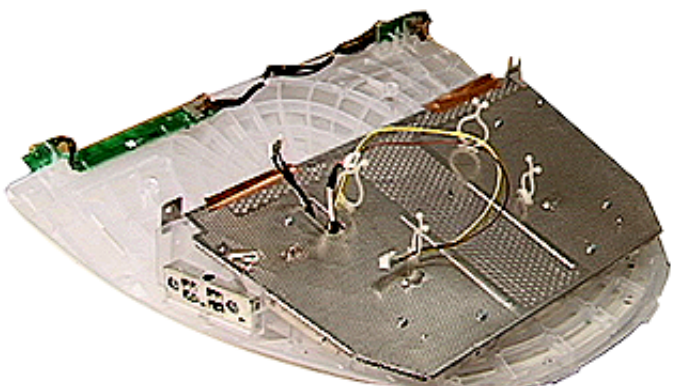


5 At both corners, remove the screw and peel back but do not remove the copper tape at the bottom housing.



6 Grasping both sides of the bottom housing, pull it away from the CRT assembly.

7 Remove the remaining loose cables from the cable clamps on the bottom housing shield.



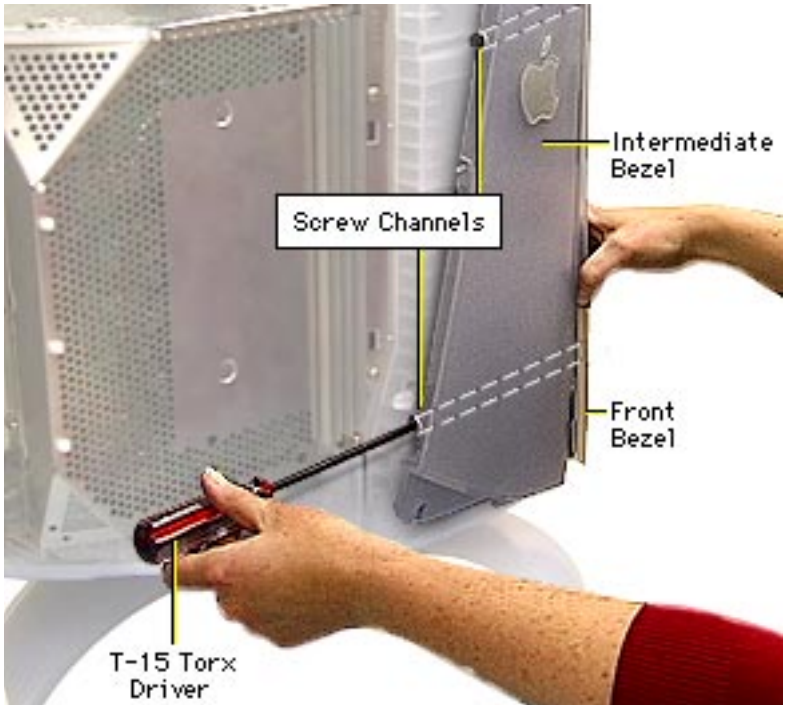
Important: The bottom housing includes the rounded plastic bottom, the bottom metal shield, the USB assembly, the three USB cables, the user controls board, and plastic cable clamps.

Front Bezel

Before you begin,

- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap

Caution: Read all of the steps in this procedure before attempting it. If you lose a screw within the display assembly, you will need a mechanic's magnet to retrieve it.



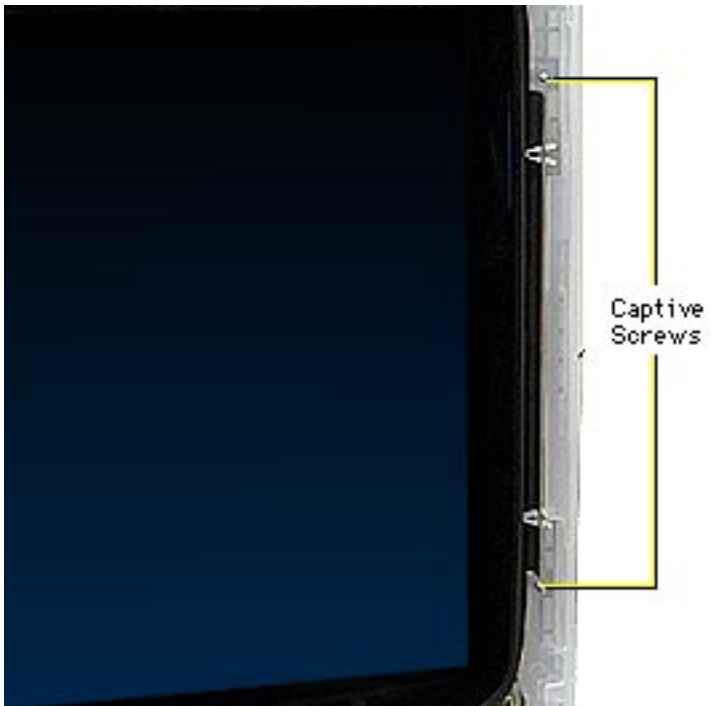
1 **Important: Loosen—but do not remove—the two captive screws at each side of the bezel as follows:**

Use a magnetized long T-15 torx driver to insert through the two screw channels on each side of the intermediate bezel.

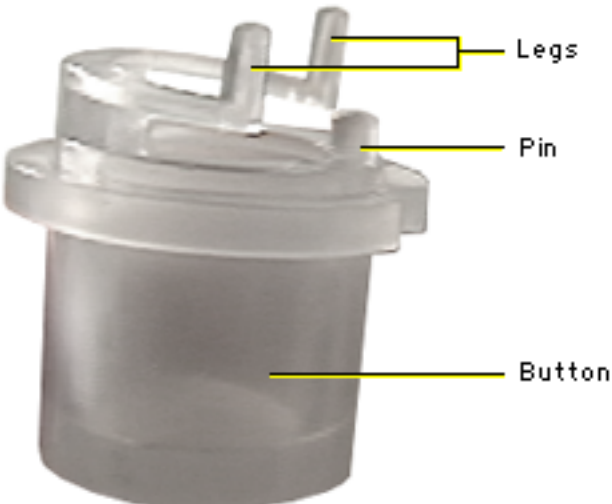
Turn the screwdriver only about four turns until the sides of the front bezel become separated from the intermediate bezel.

2 Facing the front of the display, grasp the sides of the front bezel and tilt the bottom of the front bezel up and toward you.

Caution: The front bezel is attached to the intermediate bezel at the top. If the fit is too tight, pulling the bezels apart too quickly could break the front bezel tabs. Use slow and steady force to separate the bezels.



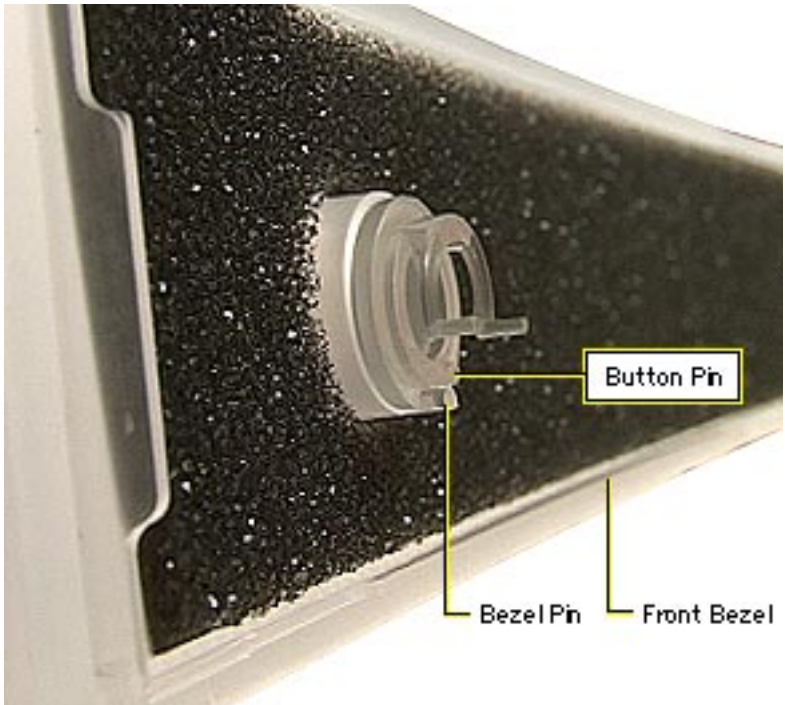
Replacement Caution: The captive screws are held in place with an integral washer; however, the screws can become loose if mishandled. Therefore, do not touch and do not remove the two captive screws at each side of the bezel. If you lose a screw within the display assembly, you will need a mechanic's magnet to retrieve it.



Replacing the Buttons

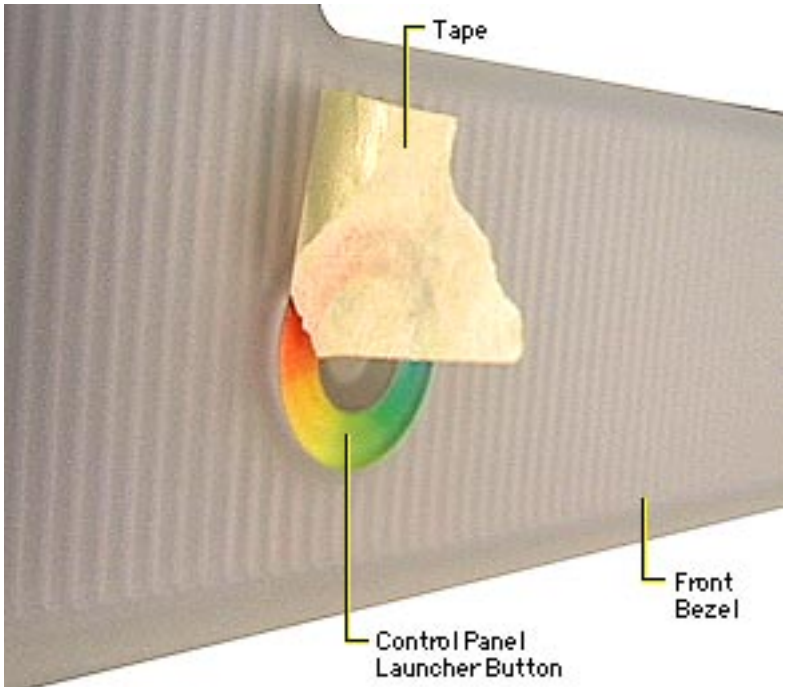
When the front bezel is removed, the control panel launcher button and the power button can fall out of the bezel. Follow these steps to properly replace them:

1 Check that the plastic legs and pin on the button are not bent or broken.



2 Insert the button in the front bezel and check that the pin on the button aligns with the pin on the inside of the front bezel.

3 Position the button as shown.

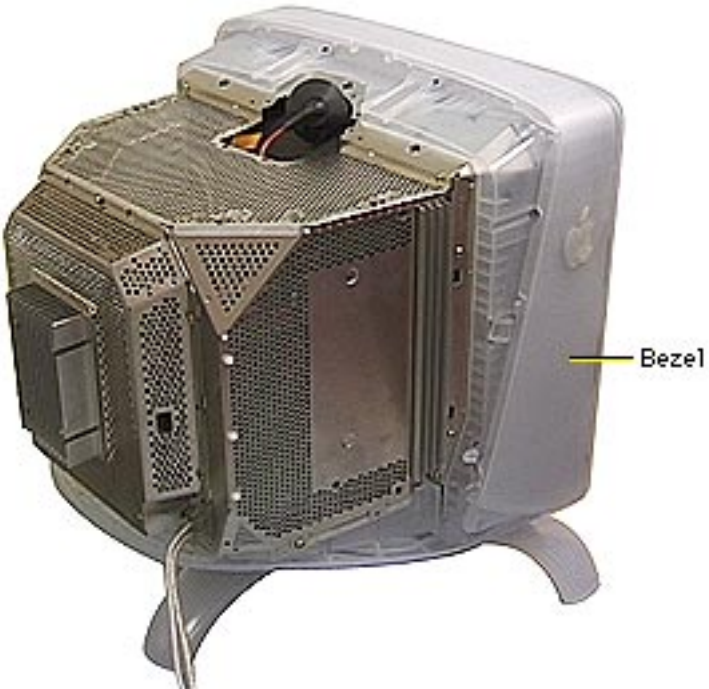


4 If necessary, secure the button in place with removable tape.

5 As you reinstall the bezel, ensure the button contacts the switch on the user controls board.

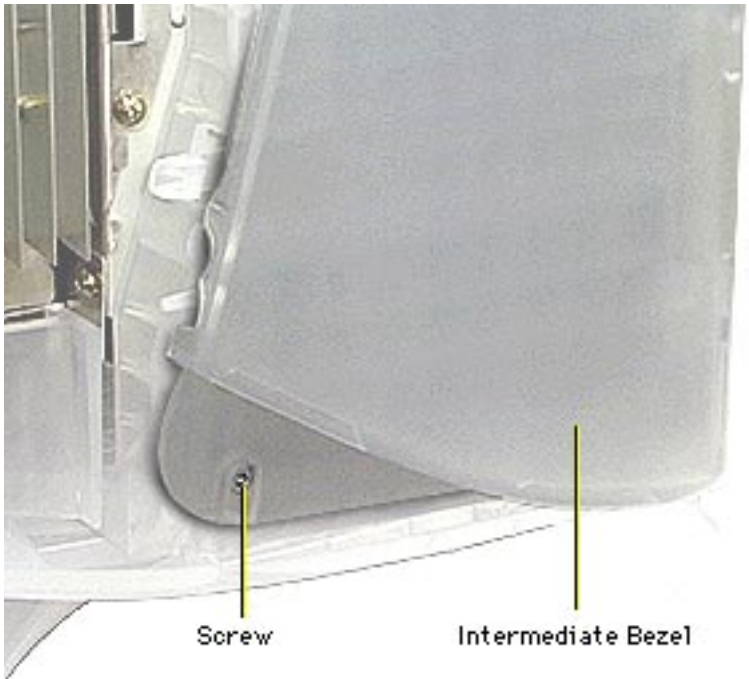
6 **Important:** After the front bezel is completely reinstalled and it is safe to turn on power, connect the display to a working unit and test the control panel launcher button a few times to ensure it works correctly.

Intermediate Bezel



Before you begin,

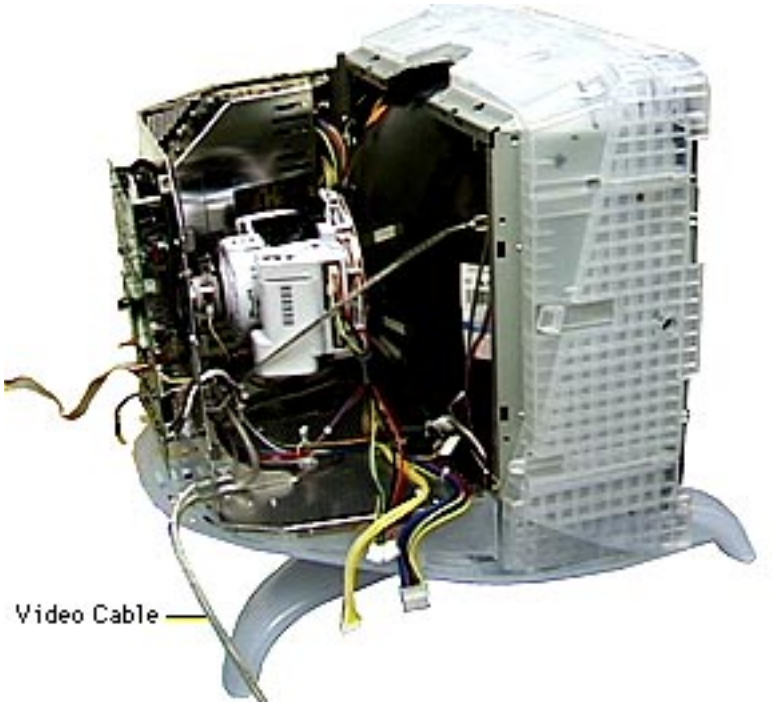
- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove front bezel



1 Remove the T-15 torx screw from the bottom of each side of the intermediate bezel.

2 Facing the front of the display, flex the sides of the intermediate bezel and tilt the back of the intermediate bezel up and toward you.

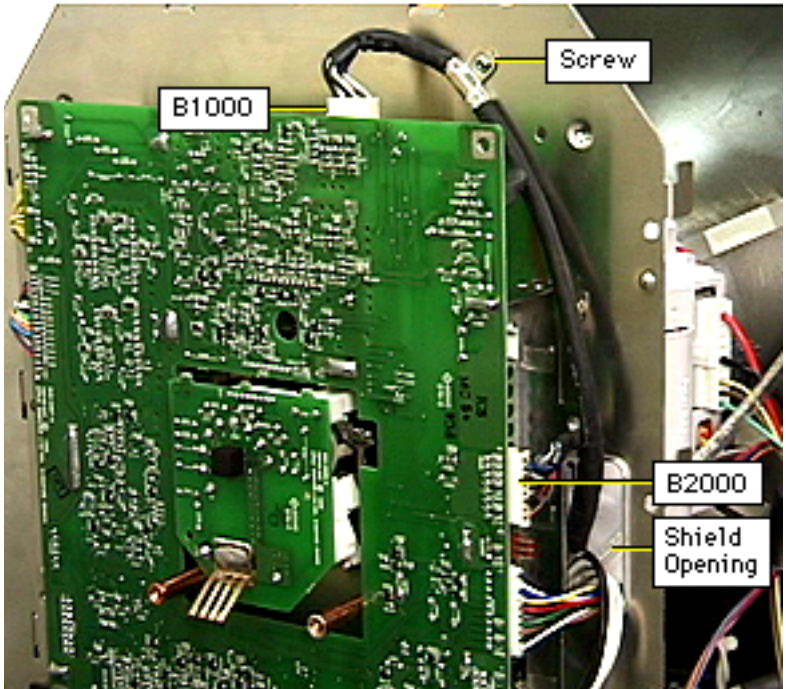
Replacement Note: The intermediate bezel part includes the inner flexible plastic shield. When reinstalling the intermediate bezel, ensure the plastic shield is properly aligned within the inner edges of the bezel.



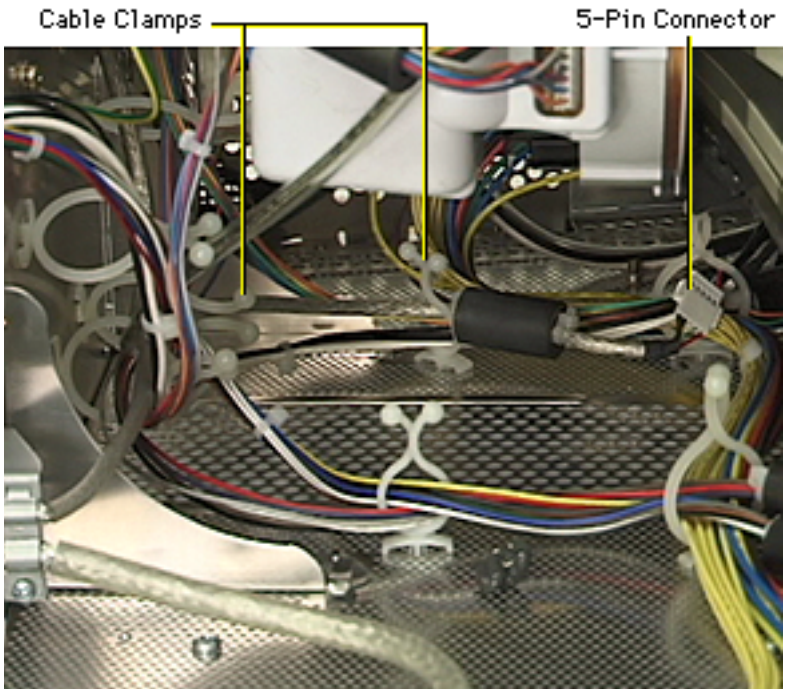
Video Cable

Before you begin,

- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield
- Remove top EMI panel
- Remove main deflection board from the hinges on the CRT/video board shield

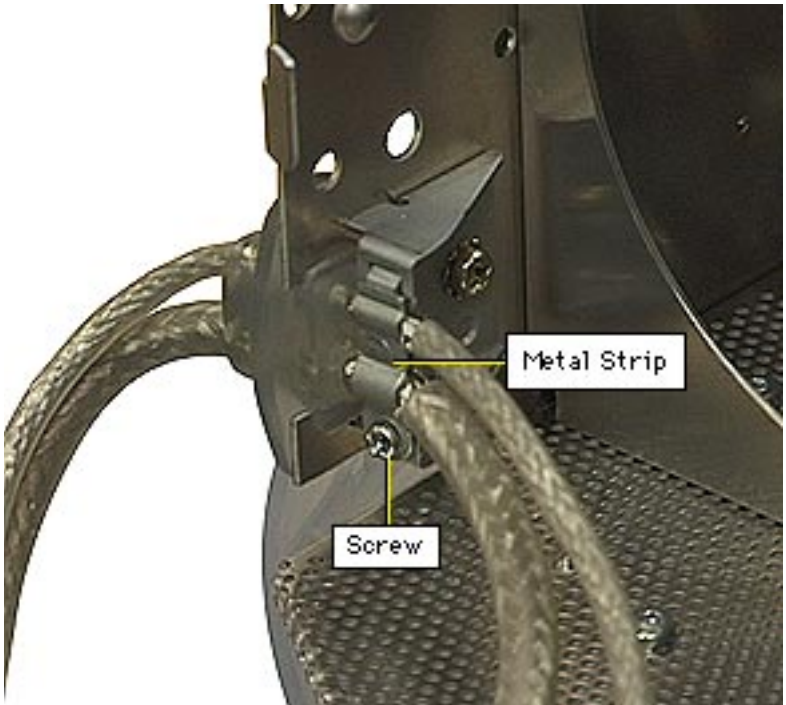


1 From the back of the CRT/video board,
- Remove the Phillips screw at the cable clip
- Disconnect connectors B1000 and B2000
- Route the end of the video cable through the shield opening

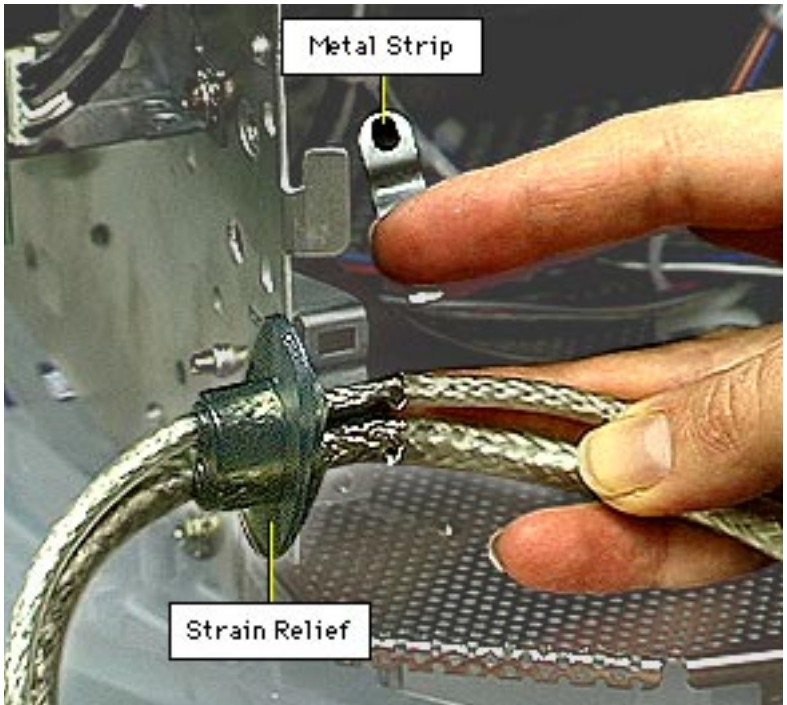


2 Disconnect the end of the USB cable at the 5-pin connector on the bottom housing.

3 Remove the USB cable from the cable clamps.



4 At the video cable strain relief, remove the Phillips screw from the metal strip.



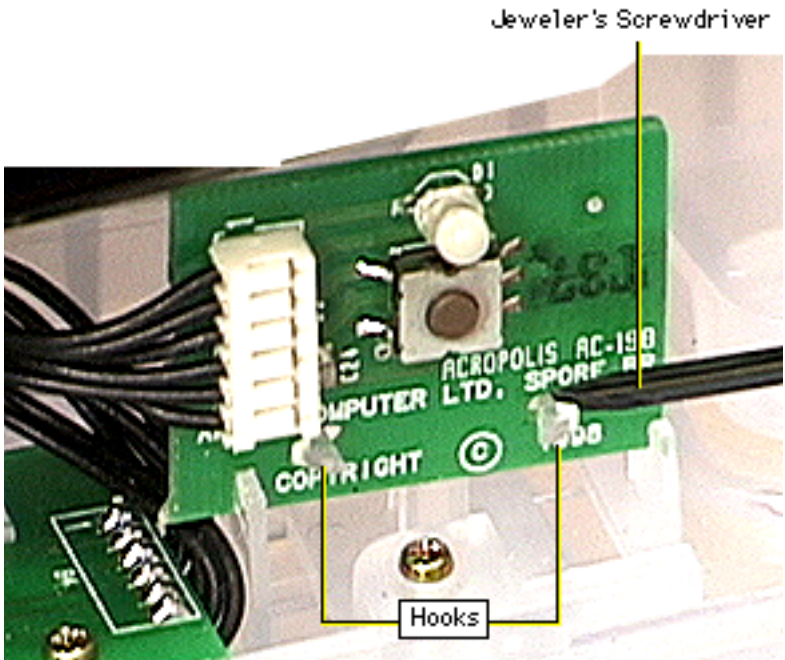
5 Remove and retain the metal strip.

6 Pull out the video cable strain relief from the CRT/video board shield.

User Controls Board

Before you begin,

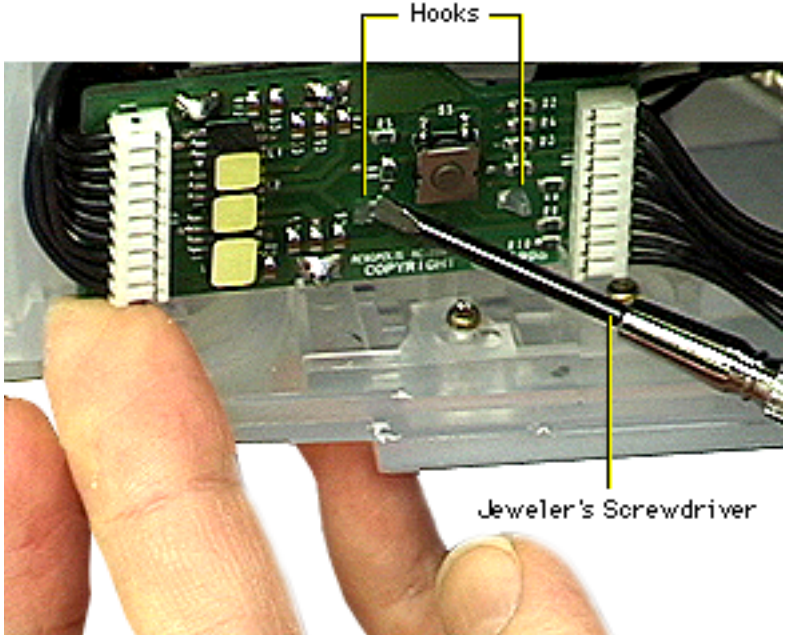
- Remove USB cover
- Remove rear housing
- Discharge CRT and remove anode cap
- Remove back EMI shield
- Remove top EMI panel
- Remove power board
- Remove main deflection board
- Remove CRT/video board
- Remove tripod stand
- Remove bottom housing



1 Starting at the power button board, use a flat-blade jeweler's screwdriver to press the two plastic hooks through the holes in the board.

2 Tilt the board forward and remove it from the plastic holder on the bottom housing.

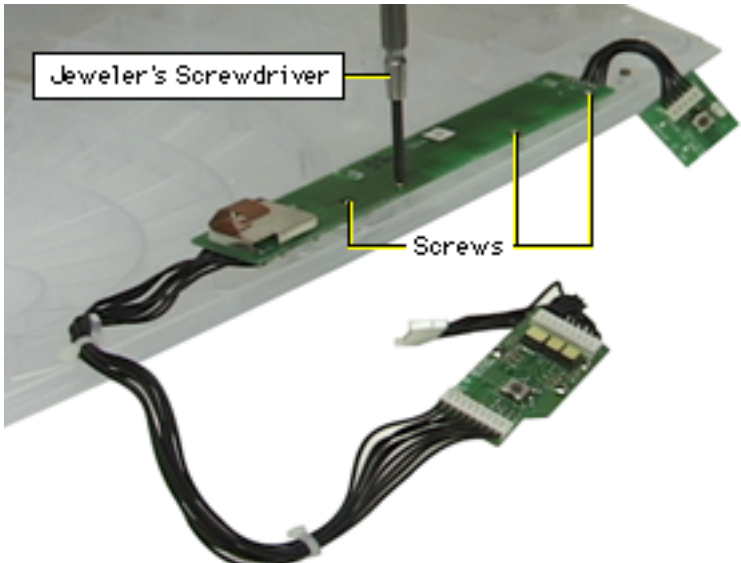
3 Allow the board to hang from its cable connection.



4 At the control panel launcher button board, use a flat-blade jeweler's screwdriver to press the two plastic hooks through the holes in the board.

5 Tilt the board forward and remove it from the plastic holder on the bottom housing.

6 Allow the board to hang from its cable connection.



7 Using a Phillips jeweler's screwdriver, remove the three screws that secure the brightness/contrast board to the bottom housing.

8 Slide the board forward while tilting the front of the board up slightly.

Replacement Note: The part for the user controls board includes the three boards and their associated cables.

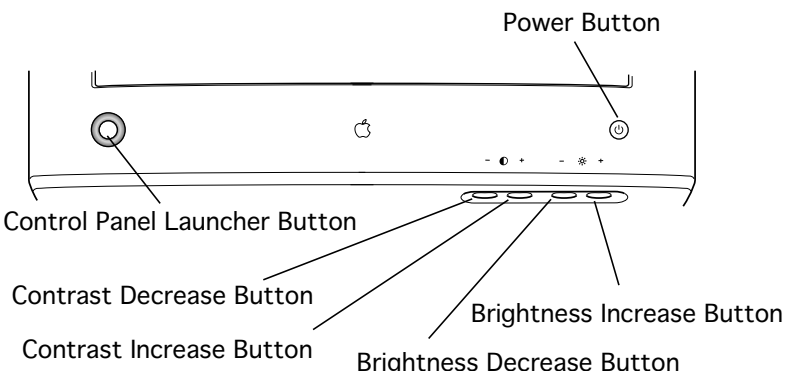
Adjustments

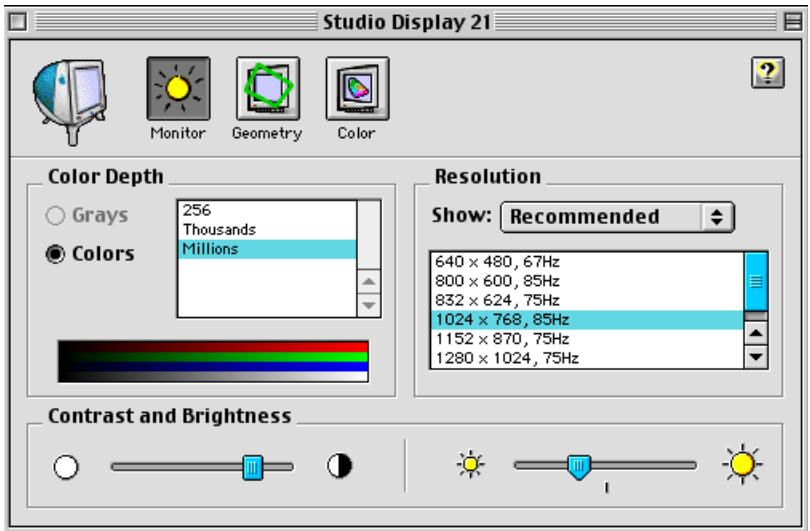
Studio Display (21" CRT, 19.8" viewable image size)

User Adjustments

The screen adjustment controls that are available to users are the front panel controls and those controls accessed by the Monitors control panel.

With the front panel controls, users can adjust brightness and contrast levels or use the control panel launcher button to open the Monitors control panel window.





Once the Apple Displays Software is installed on the Mac OS computer, users can use the Monitors control panel to optimize the display screen. Within the Monitors control panel, users can adjust color and geometry controls.

For more information, see Mac OS Help (Mac OS 8.5 or later) or Monitors Help, available when the Monitors control panel is active (Mac OS 8 or later).

Diagnostic Adjustments

Diagnostic adjustments are those display adjustments that can be made by a service provider, not by a user.

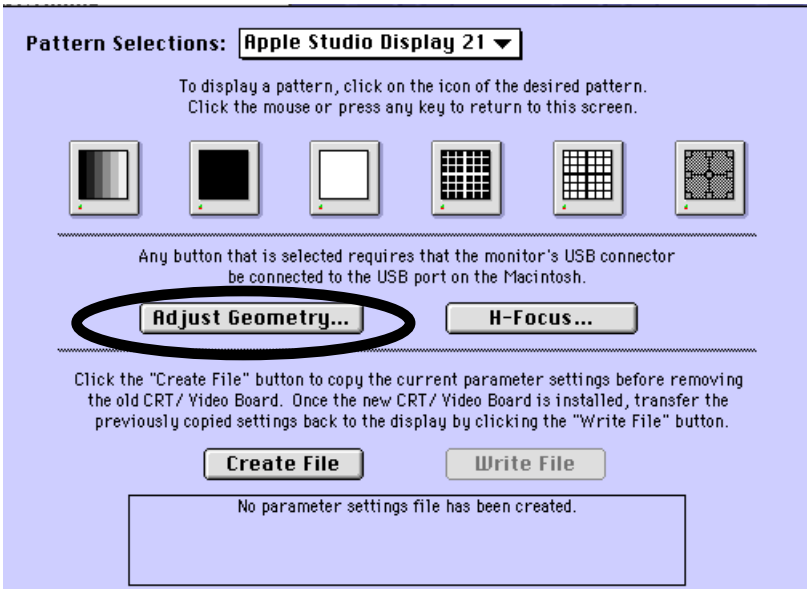
Diagnostic adjustments for this display require both

- The Monitors control panel
- The new USB Display Service Utility (USB DSU)

Important: New for this display is the USB Display Service Utility. This diagnostic utility is for use only with the USB-based Studio Display (21" CRT).

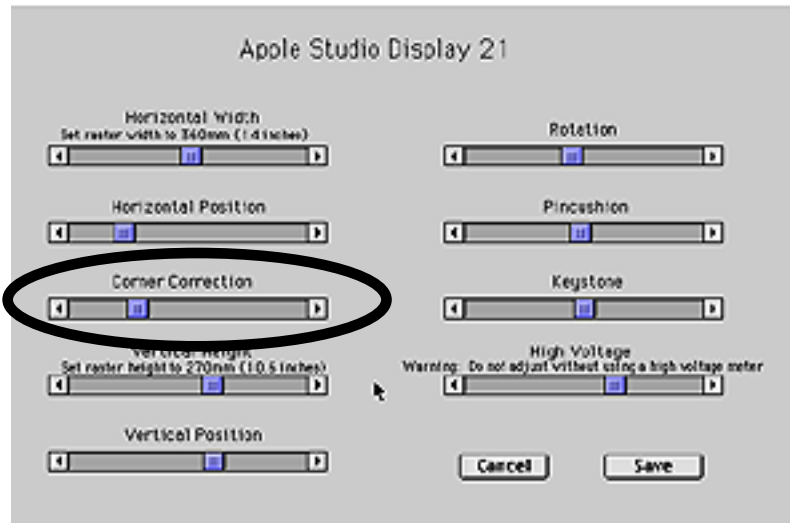
USB Display Service Utility

Important: In February 2000 version 2.1.2 of the USB Display Service Utility was introduced. Destroy previous versions of the USB Display Service Utility. To avoid loss of display parameter data, use only the latest version of the USB DSU.


Pattern Selections:
Apple Studio Display 21
To display a pattern, click on the icon of the desired pattern.
Click the mouse or press any key to return to this screen.
Any button that is selected requires that the monitor's USB connector be connected to the USB port on the Macintosh.
Adjust Geometry...
H-Focus...
Click the "Create File" button to copy the current parameter settings before removing the old CRT/ Video Board. Once the new CRT/ Video Board is installed, transfer the previously copied settings back to the display by clicking the "Write File" button.
Create File
Write File
No parameter settings file has been created.

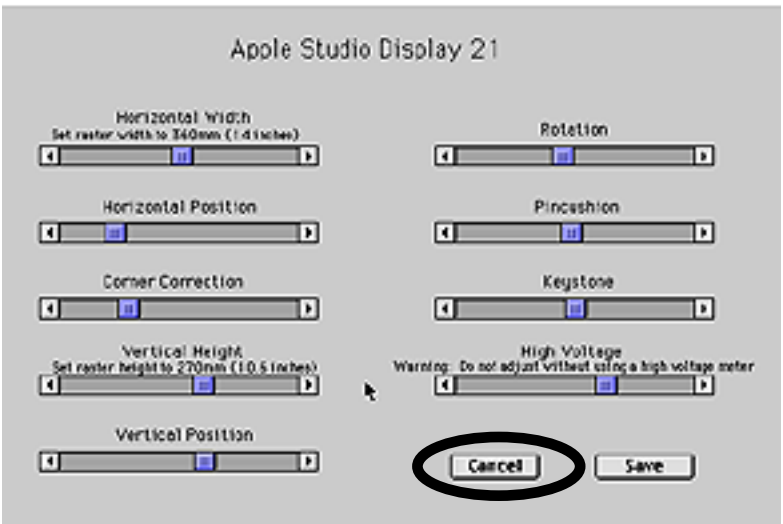
The USB Display Service Utility (USB DSU) works very much like the Display Service Utility that is used for other monitors; however, it includes a Corner Correction control. The Corner Correction is used to correct the shape of the corners of the screen.

You can access the Corner Correction control by clicking the Adjust Geometry button.



Corner Correction

When you click Adjust Geometry, a screen appears with the slider bar controls shown. Unique to this version of the Display Service Utility is the Corner Correction control. This control corrects the shape at the corners of the screen.



Unlike previous versions of the USB DSU, with version 2.1 or later if you click Cancel, any changes made are not saved and the screen reverts back to the previous look of the screen display. If you click Save, the changes are saved to both user and factory mode.

Safety Precautions for Working Inside the Display

Before you begin any procedures that require removing the housing, refer to the Take Apart chapter for complete removal instructions.

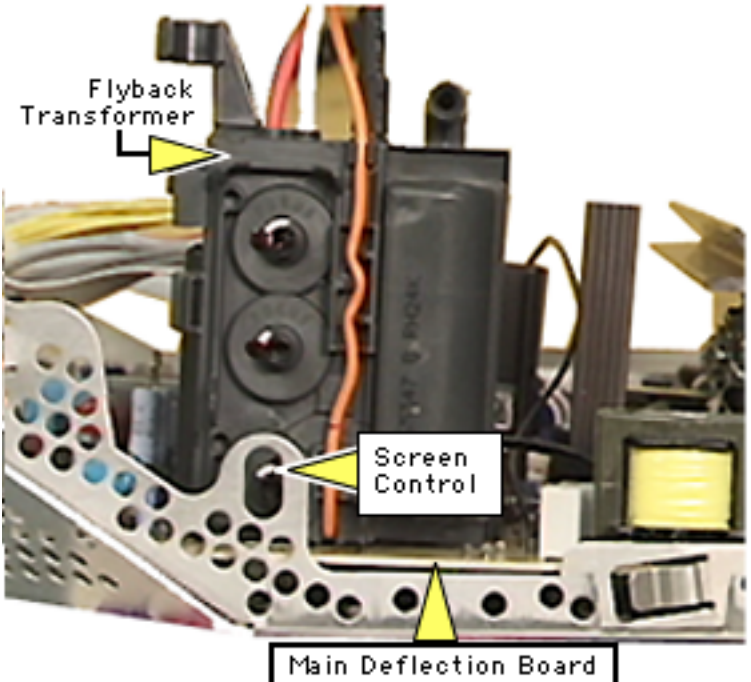
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

Warning: Because you make adjustments from the rear of the monitor, position a mirror to view the monitor screen. Do not reach around the monitor to adjust the controls.

Voltage Check at Power Board

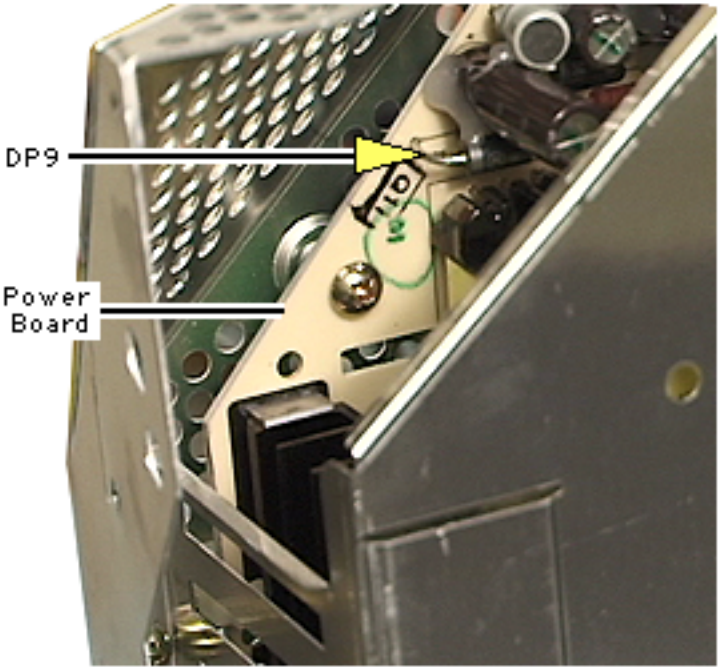
1 Turn on the monitor and set the screen resolution to 1152x870 at 75 Hz.

2 Open the USB Display Service Utility (USB DSU) and select the crosshatch pattern with the black background.



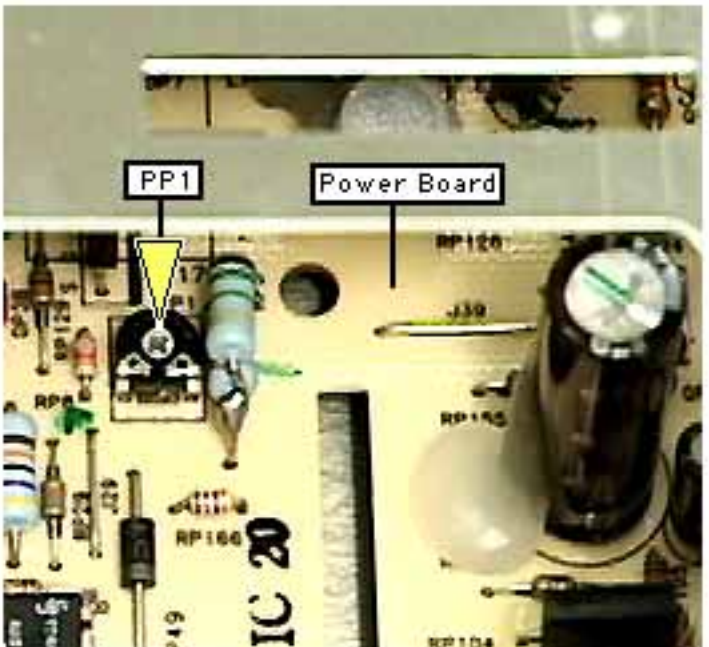
3 From the USB DSU, click Adjust Geometry. Set the Horizontal Width control to 385 mm (15 in) and the Vertical Height control to 288 mm (11 in). Confirm the screen dimensions with a tape measure.

4 Set the screen control (lowest control on the flyback transformer on the main deflection board) to minimum (counterclockwise).



5 Locate diode DP9 near the top edge of the power board.

6 Using a voltage meter, connect the negative probe to chassis ground and the positive probe to the cathode (striped end) of diode DP9. The voltage should read 6.7 V ± 0.05 V.
- If the voltage is in range, disconnect the probes and turn off the display.
- If the voltage is out of range, use a long



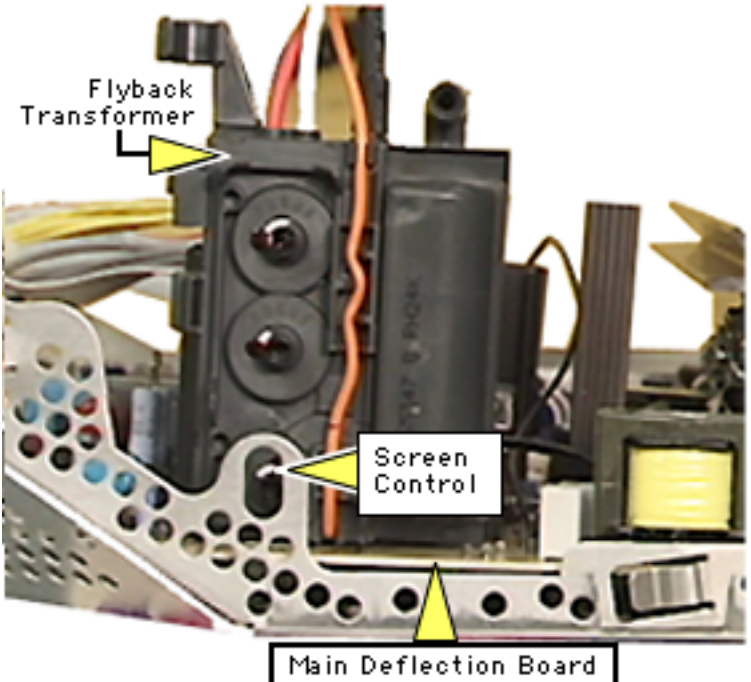
plastic hex adjustment tool to adjust potentiometer PP1, located near the top center of the power board, until the voltage comes into range.

- If the voltage cannot be adjusted into range, replace the power board as described in the Take Apart chapter.

Centering the Raster

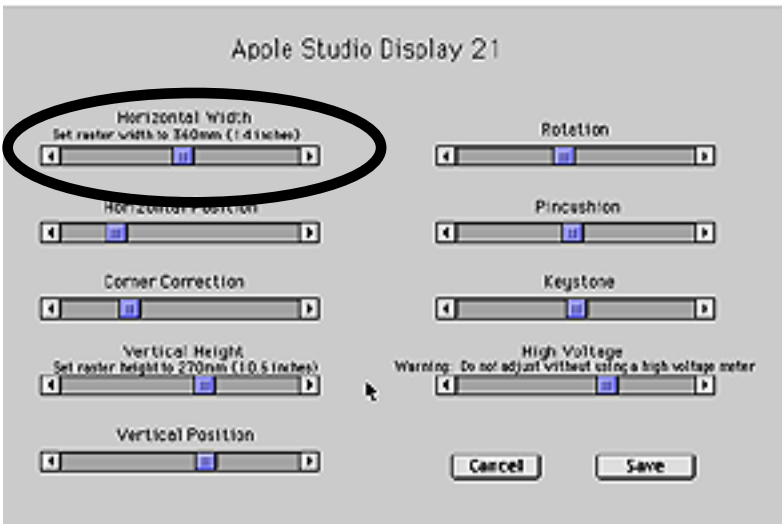
1 Turn on the monitor and set the screen resolution to 1600x1200 at 85 Hz.

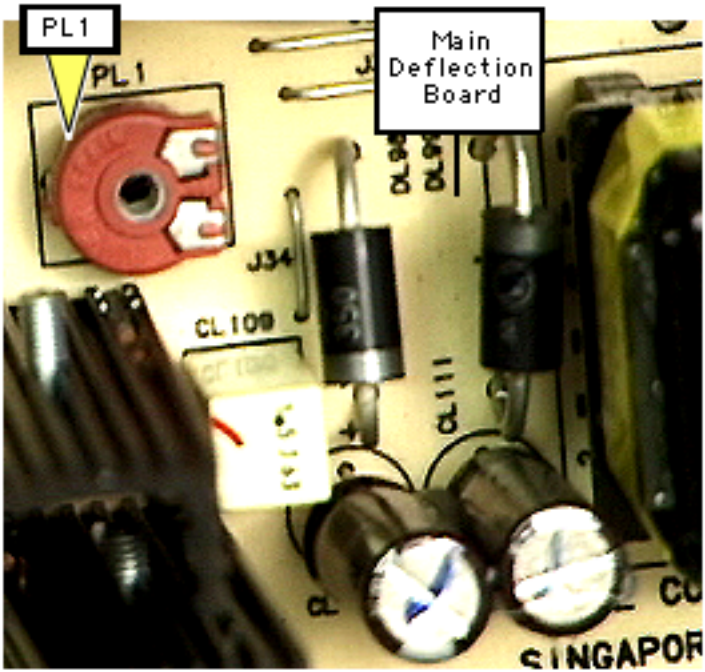
2 Open the USB Display Service Utility and select the crosshatch pattern with the black background.



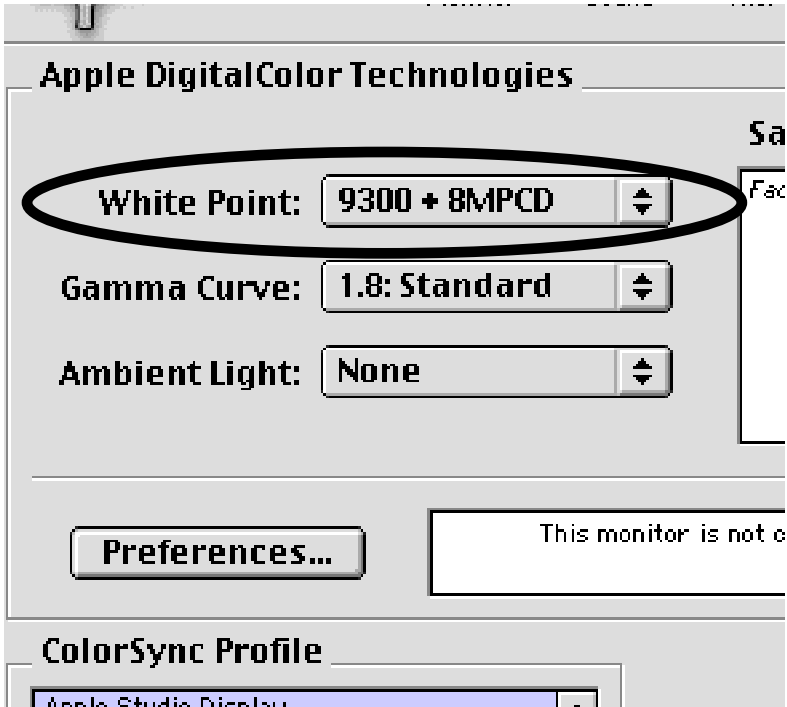
3 Adjust the screen control (lowest control on the flyback transformer on the main deflection board) until the background raster is visible.

4 From the USB DSU, click Adjust Geometry. Set the Horizontal Width control to 385 mm (15 in).



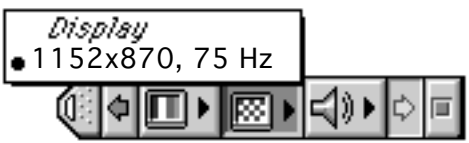


5 With the screen sized to a nominal width of 385 mm, adjust potentiometer PL1 to shift the raster 2 mm – 2.5 mm to the left side of the screen.



Screen Adjustment

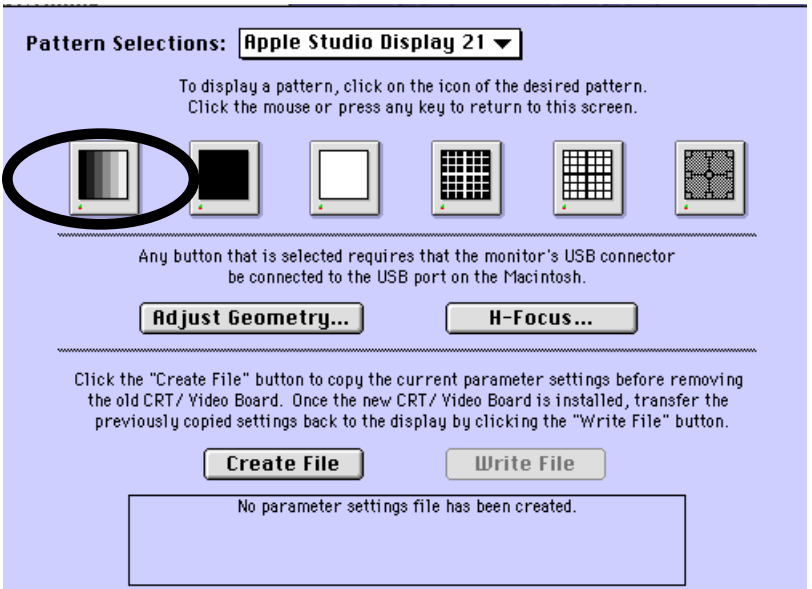
1. Turn on the display and let it warm up for five minutes.
2. Using the Color screen from the Monitors control panel, set white point to 9300 + 8MPCD (default).

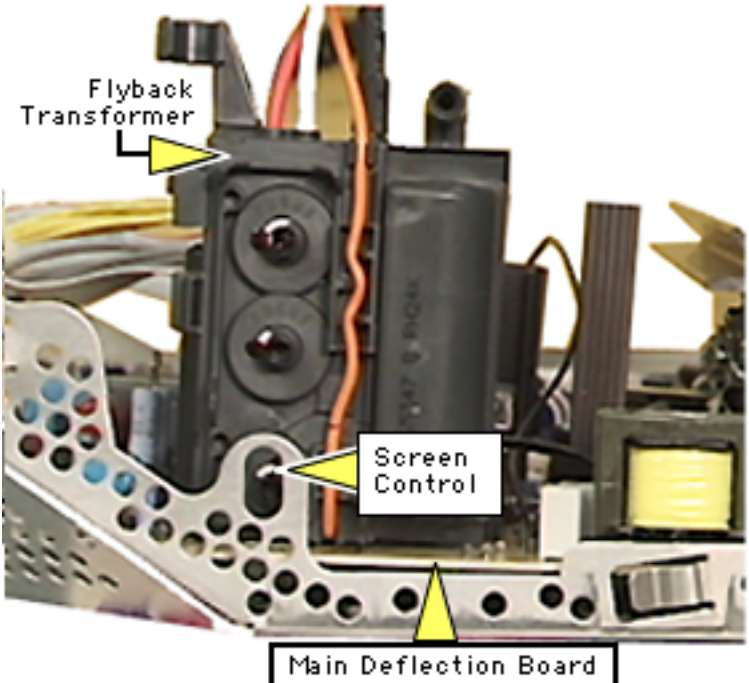


3 Using the control strip, set the screen resolution to 1152x870 at75 Hz.

4 Using the front panel controls, set
- Brightness to detent (mid-point)
- Contrast to maximum

5 Using the USB DSU, select the gray bars pattern.


Pattern Selections:
Apple Studio Display 21
To display a pattern, click on the icon of the desired pattern.
Click the mouse or press any key to return to this screen.
Any button that is selected requires that the monitor's USB connector be connected to the USB port on the Macintosh.
Adjust Geometry...
H-Focus...
Click the "Create File" button to copy the current parameter settings before removing the old CRT/ Video Board. Once the new CRT/ Video Board is installed, transfer the previously copied settings back to the display by clicking the "Write File" button.
Create File
Write File
No parameter settings file has been created.



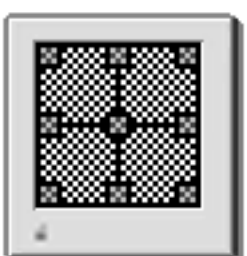
6 With the room lights dimmed, use a plastic screwdriver to slowly adjust the Screen control so that the leftmost bar is completely black.

7 Adjust the Screen control so the second bar appears as black as the leftmost bar. Then adjust so the second bar can be distinguished from the leftmost bar, but the leftmost bar remains black. Only the leftmost bar should be completely black.

Focus

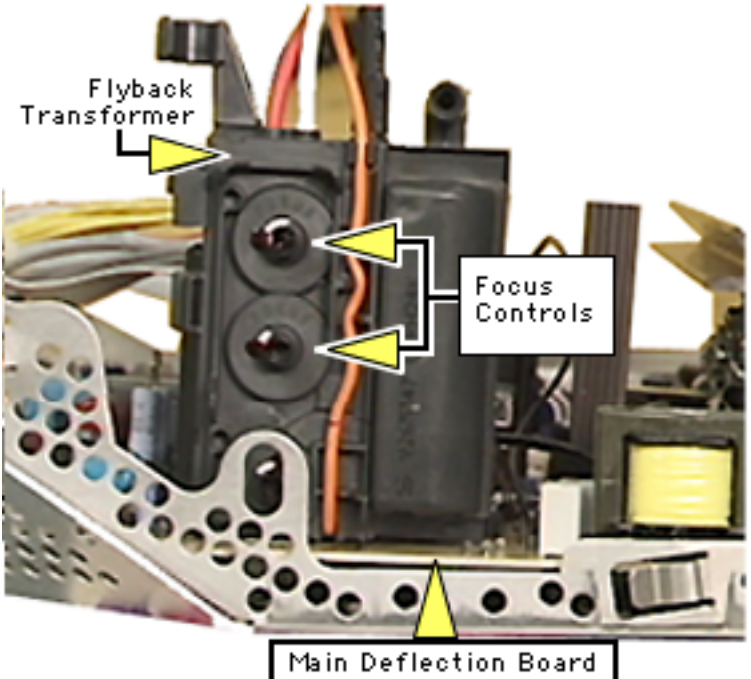
1 Open the Monitors control panel, and click Convergence for best overall convergence.

Note: Misadjusted convergence is often diagnosed as poor focus.



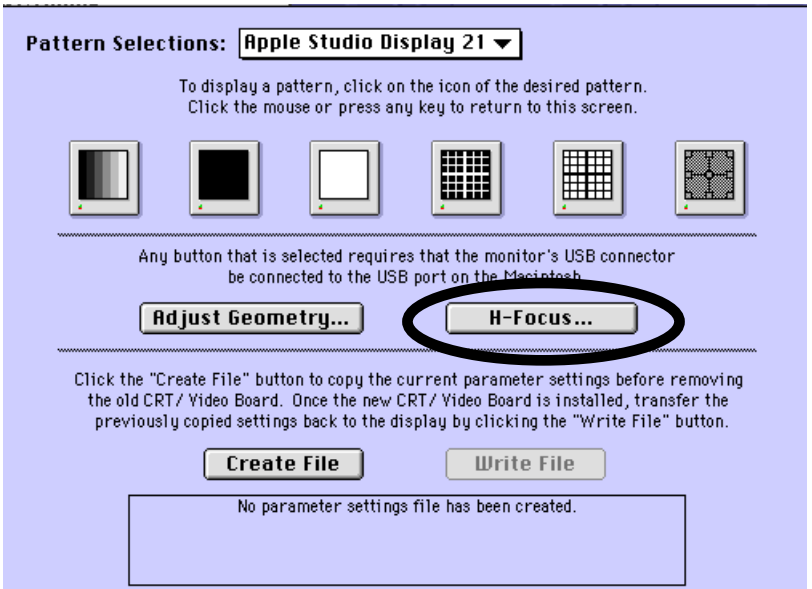
2 Using the control strip, set the screen resolution to 1600x1200 at 85 Hz.

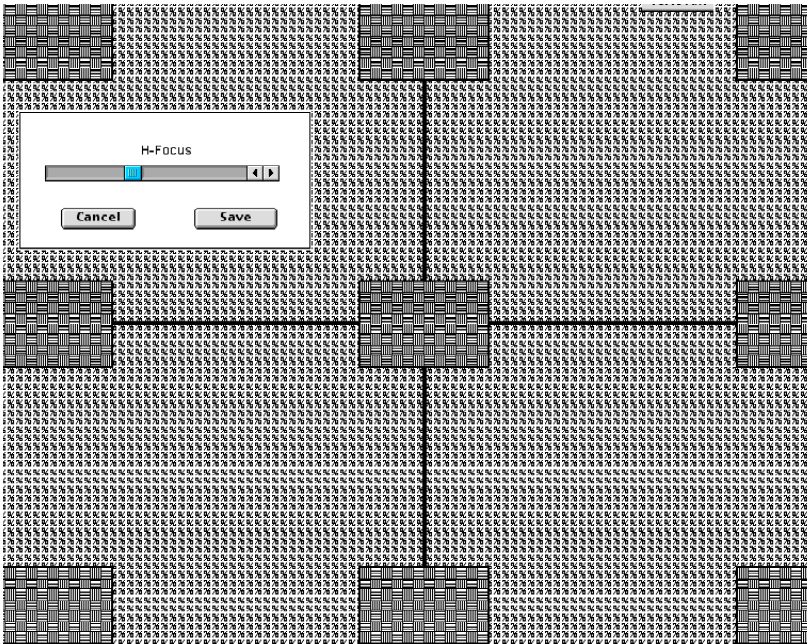
3 Run the USB DSU, and select the focus pattern (percent signs).



4 Adjust horizontal and vertical focus controls (two top controls on the flyback transformer) for best center-of-screen performance. If necessary, readjust each focus control to optimize overall focus.

5 If the focus varies between the center of the screen and the outer edge, run the USB DSU and click the H-Focus button.


Pattern Selections:
Apple Studio Display 21
To display a pattern, click on the icon of the desired pattern.
Click the mouse or press any key to return to this screen.
Any button that is selected requires that the monitor's USB connector
be connected to the USB port on the Macintosh.
Adjust Geometry...
H-Focus...
Click the "Create File" button to copy the current parameter settings before removing
the old CRT/ Video Board. Once the new CRT/ Video Board is installed, transfer the
previously copied settings back to the display by clicking the "Write File" button.
Create File
Write File
No parameter settings file has been created.



6 Clicking H-Focus brings up a screen you can use to improve the dynamic focus (overall focus with respect to center, sides, and top/bottom of screen).

Drag the H-Focus slider control to adjust overall focus.

Unlike previous versions of the USB DSU, with version 2.1 or later if you click Cancel, any changes made are not saved and the screen reverts back to the

previous look of the screen display. Click Save to save a new setting.

If necessary, repeat steps 3 and 4.

7 Using the control strip, set the screen resolution to 1152x870 at 75 Hz. Run the USB DSU and select the focus pattern (percent signs). If focus is not optimal, repeat steps 3 through 6 at this screen resolution. Then set the screen resolution to1600x1200 at 85 Hz, and check the focus pattern. If it is still not optimal, repeat steps 3 through 6 at 1600x1200 at 85 Hz.

Downloading Setup Parameters and Replacing the CRT/Video Board

Caution: The USB Display Service Utility (USB DSU) versions are not backward compatible. So a parameter file that is created by one version will not be recognized by another version. Therefore, to avoid loss of data, use only the latest version of the USB DSU for this entire procedure.

The following steps show the procedure for

- Creating (downloading) a parameter settings file
- Duplicating the parameter settings file
- Replacing the CRT/video board
- Writing (uploading) the parameter settings

Download Parameter Settings

1 Turn on the computer and the monitor.

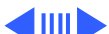
Important: If the Studio Display (21" CRT) screen is blank or unreadable, follow the steps in the section “Connecting a Second Display for Downloading Setup Parameters” in this chapter.

2 Open the USB Display Service Utility (USB DSU).

3 To download parameters from the CRT/video board, click Create File. A message appears explaining that the process will take about 30 seconds.

4 When the message disappears, a new file called Parameter Settings MBY is created on the same level as the USB Display Service Utility application.

Caution: To avoid loss of data, do not move or rename the Parameter Settings MBY file.



Duplicate the Parameter Settings File

1. Locate the Parameter Settings MBY file, but do not move or rename it.
2. Beside the Parameter Settings MBY file create a new folder.
3. Name the new folder Parameter File Backup.
4. Hold down the option key and drag the Parameter Settings MBY file onto the Parameter File Backup folder.
5. Shut down the monitor. Unplug the power cord.

Replace the CRT/Video Board

1. Remove the defective CRT/video board and replace it with a new CRT/video board. Refer to the CRT/Video Board topic in the Take Apart chapter.
2. Reattach the power cord. Restart the computer.

3 Open the USB DSU.

Upload Parameter Settings

1 To upload parameter settings, use the USB DSU and click Write File. A message appears explaining that the process will take about 2.5 minutes.

Note: If the Write File button is grayed out, this means the application can't find the Parameter Settings MBY file. Make sure you did not move or rename the original file.

Important: If the upload process is unsuccessful, an error message will appear and the Parameter Settings MBY file will not be deleted. In this case, restart the computer and turn the monitor off and on. Retry the upload procedure at least three times. If it still fails after the third attempt, replace the CRT/video board.

2 When the message disappears, quit the USB DSU.

3 Turn off the monitor. After about 5 seconds, turn on the monitor.

4 Check your version of Apple Displays Software.
- If using Apple Displays Software version 1.7.1 or earlier, drag the AppleVision Preferences file into the trash. Restart the computer.
- If using Apple Displays Software version 1.8 or later, open the Preferences folder; open the Apple Monitor Plugins Prefs folder; and drag the AppleVision Preferences file into the trash. Restart the computer.

5 Open the Monitors control panel, and click the Geometry button.

6 Hold down the option key and click Factory Settings.

7 Go to the next procedure: “Adjusting the Display after Replacing the CRT/Video Board.”

Adjusting the Display after Replacing the CRT/ Video Board

Caution: Perform this procedure only after you've replaced the CRT/video board and uploaded the parameter settings.

After replacing the CRT/video board, some adjustment is necessary. The following steps show the procedure for

- Adjusting screen geometry
- Recalibrating white points

Adjust Geometry

If the screen is displaying keystoning, open the USB Display Service Utility (USB DSU), and click the Adjust Geometry button. Using the keystone slider control, adjust the width of the top and bottom of the screen. If necessary, use the USB DSU to make other geometry adjustments.

Recalibrate White Points

Caution: If the video cable is connected to a third-party video card that uses proprietary color calibration drivers, you might need to disable the drivers to use the AppleVision color calibration functions.

1 After you've rewritten the file, as instructed in "Upload Parameter Settings," restart the system.

2 Open Monitors control panel, and select Color.

3 Select the default 9300 white point and click Recalibrate.
- If you later choose another white point such as 6500 or D50, you must click Recalibrate for the changes to take effect.
- If the display looks blurry after recalibrating, adjust convergence as described in the previous section.
- If you hold down the option key and click Factory

Settings, it might be necessary to perform a minor convergence adjustment using Monitors control panel.

4 If the Recalibration fails, a warning message will appear. Click OK and click Recalibrate again.

5 If the recalibration fails again, use the duplicated file to upload the parameter settings. (Hold down the option key and drag the Parameter Settings MBY file out of the Parameter File Backup folder; then follow the procedure under “Upload Parameter Settings.”) Adjust the display. If the recalibration fails again, click Recalibrate.

These multiple recalibration attempts might seem excessive, however tests have confirmed a high success rate at saving the display.

6 If the recalibration fails again (after the fourth attempt), call Apple Technical Support. (In the US, call 1-800-919-2775, option 3.)

Connecting a Second Monitor for Downloading Setup Parameters

If the Studio Display (21" CRT) screen is black or unreadable and you need to replace the CRT/video board, you can connect a second known-good monitor for viewing the USB DSU to download setup parameters.

Important: The setup for the second monitor depends on the computer system you are using (for PowerBooks, see the note and warning on the next page). In most cases, connect the video cable from the Studio Display (21" CRT) to the built-in video port and connect the second monitor (used for viewing) to the video card. However, if the menu bar does not appear on the known-good display with this common setup, shut down the system, switch the video cable connections, and restart the system.

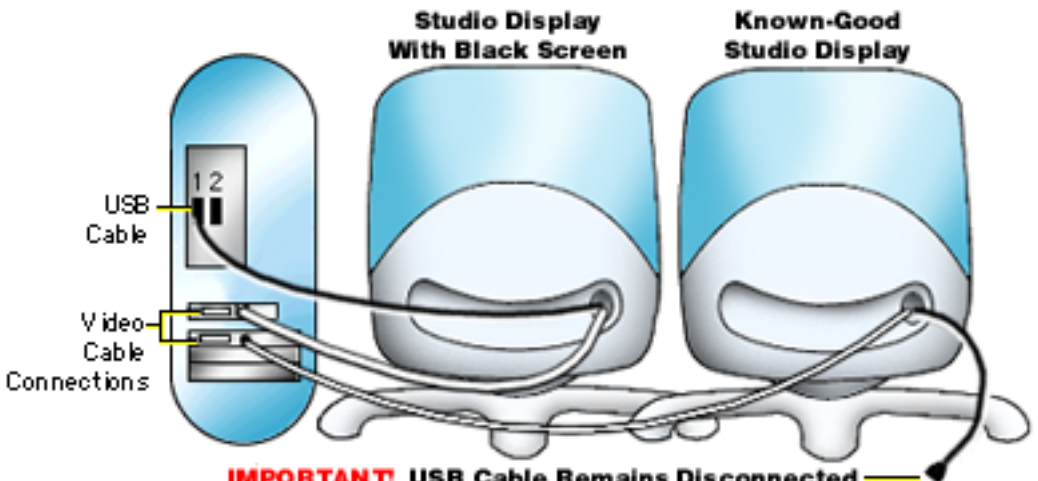
Important: If using a second Studio Display (21" CRT) as the known-good monitor, refer to “When the Second Display Is a Studio Display (21" CRT)” in this chapter.

Note: If a PowerBook G3 Series (Bronze keyboard) is available, connect the Studio Display (21" CRT) to the PowerBook as described in “When the Second Display is a PowerBook G3 Series (Bronze keyboard).”

Warning: If a PowerBook (FireWire) is available, connect the Studio Display (21" CRT) to the PowerBook as described in “When the Second Display is a PowerBook (FireWire).” You must follow this procedure exactly to avoid loss of data or functionality.

When the Second Display Is a Studio Display (21" CRT)

Important: When using a second Studio Display (21" CRT) as the known-good monitor, do not connect the known-good monitor's USB cable to the computer.



With the Studio Displays connected as shown, the menu bar should appear on the known-good monitor. However, if it does not appear on that monitor, shut down the system and switch the video cable connections on the back of the computer. When you turn on the displays, the menu bar should then appear on the known-good display.

1 With the menu bar on the known-good display, open the USB Display Service Utility.

2 Click Create File.

3 When the Create File process is finished, shut down both monitors.

4 Disconnect the known-good monitor from the computer and place it aside. (You are finished with it for this procedure.)

5 Replace the CRT/video board in the monitor that exhibited the symptom.

6 Turn on the monitor and computer:

- If the CRT/video board was the problem, you will see a screen image. The screen image might be out of adjustment, but it will be readable. Click Write File and continue the procedure described in “Downloading Setup Parameters and Replacing the CRT/Video Board” in this chapter. Then follow the steps in “Adjusting the Display after Replacing the CRT/Video Board.”.
- If the symptom still occurs, check for loose cable connections (external and internal) and check connections to the power board. If the symptom remains, reinstall the original CRT/video board in the monitor, and replace the main deflection board. Then follow the steps in “Adjusting the Display after Replacing the Main Deflection Board.”

When the Second Display Is a PowerBook G3 Series (Bronze keyboard)

When using the PowerBook G3 Series (Bronze keyboard) with a Studio Display (21" CRT) that displays a black screen, you can use the PowerBook's LCD to access the Studio Display's desktop. However, when you first connect the Studio Display (21" CRT) to the PowerBook G3 Series (Bronze keyboard), you will see a desktop with no menu bar.

To access the menu bar,

1 Shut down the PowerBook and disconnect the Studio Display (21" CRT).

2 With the Studio Display (21" CRT) disconnected, turn on the PowerBook.

3 When the desktop appears, locate the Display

Preferences file in the USB Display Service Utility folder.

4 Drag the new Display Preferences file into the Preferences folder (in the System Folder). This step replaces the Display Preferences.

5 Shut down the PowerBook and reconnect the Studio Display (21" CRT). Turn on the PowerBook and Studio Display.

6 Now you can launch the USB DSU to click Create File and replace the CRT/video board as described in “Downloading Setup Parameters and Replacing the CRT/Video Board” in the Adjustments chapter.

Once you have replaced the CRT/video board and need to make adjustments to the Studio Display (21" CRT) screen,

1 Shut down the PowerBook and reconnect the Studio

Display (21" CRT) video and USB cables.

2 Restart the PowerBook, but when you hear the startup chime, close the lid of the PowerBook so the video image will appear on the Studio Display only.

3 Once you see the Mac OS screen on the Studio Display, you can open the PowerBook lid.

4 Now you can adjust the Studio Display using the keyboard and trackpad on the PowerBook. Refer to “Adjusting the Display after Replacing the CRT/Video Board.”

When the Second Display Is a PowerBook (FireWire)

Warning: You must follow this procedure exactly to avoid loss of data or functionality.

Warning: The PowerBook (FireWire) automatically shows the menu bar on its screen when connected to a Studio Display (21" CRT). Do not move the menu bar to the Studio Display screen at any time when using the USB Display Service Utility. Doing so could cause loss of data or computer functionality.

Note: To distinguish the PowerBook (FireWire) from the PowerBook G3 Series (Bronze keyboard), note the two FireWire ports on the back of the PowerBook (FireWire).

When using the PowerBook (FireWire) with a Studio Display (21" CRT) that displays a black screen, you can use the PowerBook's LCD to access the Studio Display's desktop.

To access the menu bar,

1 With power off, connect the Studio Display (21" CRT) to the PowerBook (FireWire).

2 Turn on the PowerBook (FireWire) and the Studio Display.

3 Launch the USB DSU, and click Create File. Then replace the CRT/video board as described in “Downloading Setup Parameters and Replacing the CRT/Video Board” in this chapter.

Once you have replaced the CRT/video board and need to make adjustments to the Studio Display (21" CRT) screen,

1 Shut down the PowerBook and reconnect the Studio Display (21" CRT) video and USB cables.

2 Restart the PowerBook, but when you hear the startup chime, close the lid of the PowerBook so the video image

will appear on the Studio Display only.

3 Once you see the Mac OS screen on the Studio Display, you can open the PowerBook lid.

4 Now you can adjust the Studio Display using the keyboard and trackpad on the PowerBook. Refer to “Adjusting the Display after Replacing the CRT/Video Board.”

Adjusting the Display after Replacing the Main Deflection Board

After replacing the main deflection board, perform the following adjustments for these five modes (screen resolutions):

- 640x480 at 67 Hz
- 832x624 at 75 Hz
- 1152x870 at 75 Hz
- 1280x1024 at 75 Hz
- 1600x1200 at 85 Hz

1 Using the control strip (or the Monitors control panel), select 1600x1200 at 85 Hz, the highest of the five screen resolutions.

2 Open the USB Display Service Utility (USB DSU) and click the Adjust Geometry button.

Note: Clicking the Adjust Geometry button causes the

DSU to automatically check high voltage (EHT). If the high voltage is out of range, the USB DSU will load a nominal value.

3 Refer to the procedure called “Checking High Voltage” in the Troubleshooting chapter to verify that the high voltage is 27 V (± 0.5 V). If the high voltage is not within range, adjust the high voltage using the USB DSU, the multimeter, and the high-voltage probe. Use the high voltage slider control on the USB DSU to make final adjustments.

4 Using the USB DSU, select the focus pattern (percent signs). Adjust horizontal and vertical focus controls (two top controls on the flyback transformer) for best center-of-screen performance. If necessary, readjust each focus control to optimize overall focus.

5 Using the USB DSU, click the H-Focus button to improve the dynamic focus. Drag the H-Focus slider control until

the screen shows the best overall focus balance from center to top, bottom, and sides of screen.

6 If necessary, repeat steps 3 and 4 for the best overall focus.

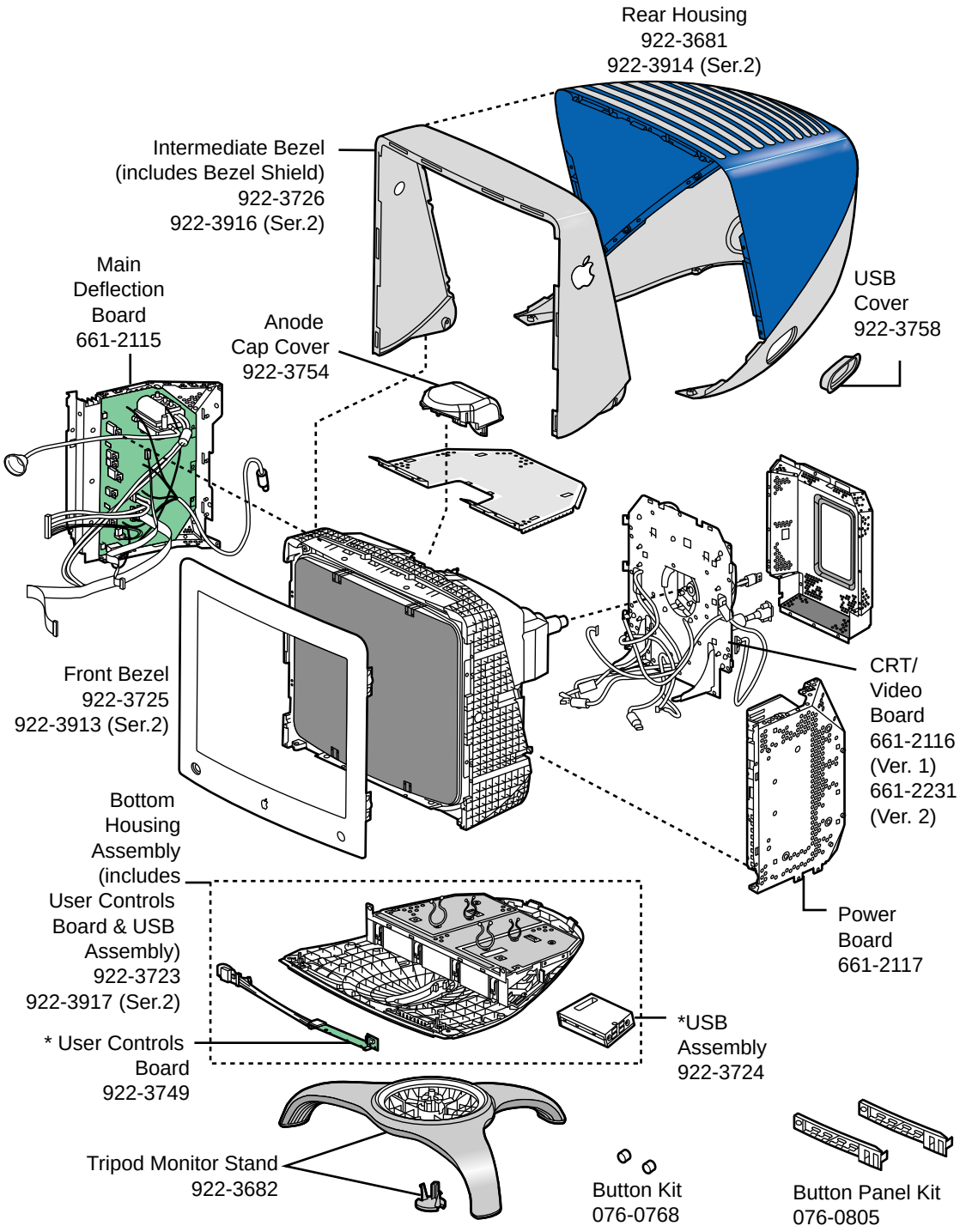
7 Check the screen to see if any minor geometry adjustments are necessary. If so, use the USB DSU geometry slider controls.

8 For the four remaining screen resolutions, check the screen, and if necessary, repeat this procedure but leave out steps 2, 3, and 4.

Exploded View

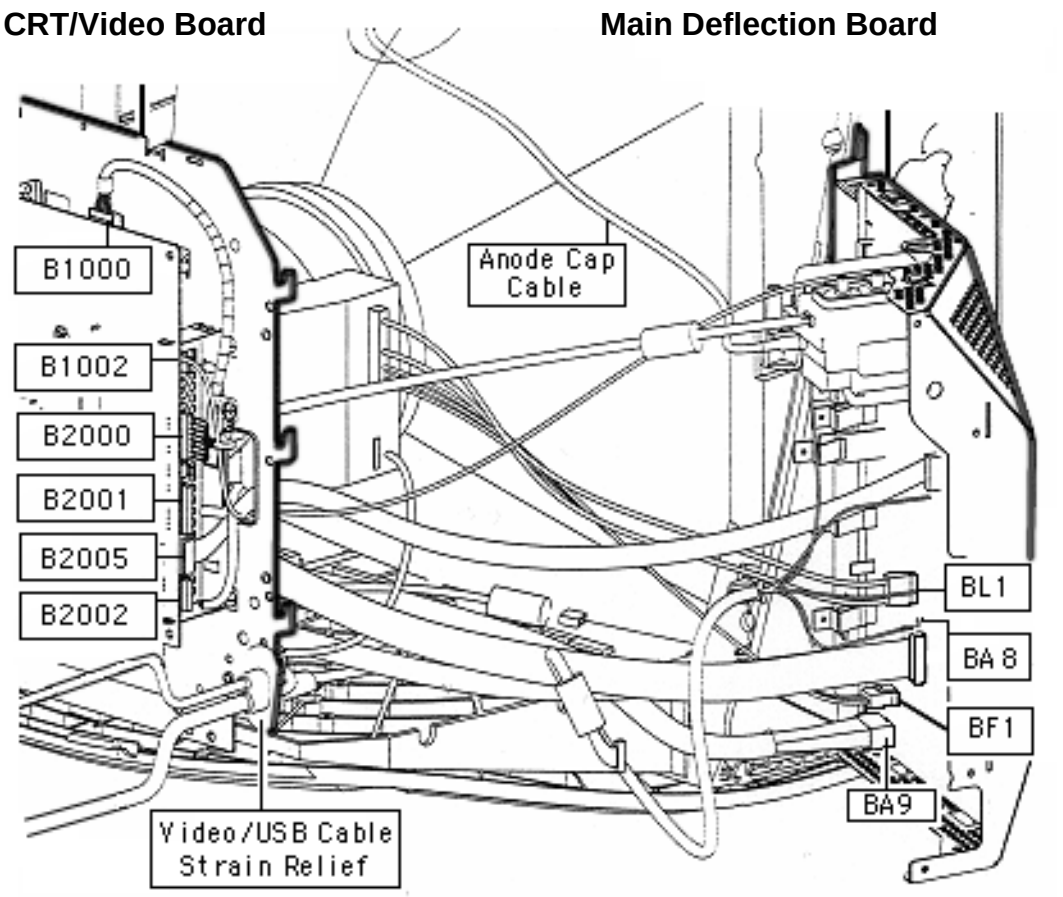
Studio Display (21" CRT, 19.8" viewable image size)

Apple Studio Display (21" CRT)



*Also offered separately

Detachable Cables: Main Deflection Board and CRT/Video Board



Detachable Cables: Power Board and CRT/Video Board